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UNIVERSAL CYCLOPÆDIA AND ATLAS

A NEW EDITION UNDER DIRECTION OF

CHARLES KENDALL ADAMS, LL.D.
PRESIDENT OF THE UNIVERSITY OF WISCONSIN
EDITOR-IN-CHIEF

ASSISTED BY A CORPS OF ASSOCIATE EDITORS
COMPOSED OF THE ABLEST AND MOST DISTINGUISHED SCHOLARS
IN THE UNITED STATES AND CANADA, AND OF EMINENT
SPECIALISTS IN BOTH EUROPE AND AMERICA

A NEWLY REVISED AND ENLARGED EDITION

ROSSITER JOHNSON, PH.D., LL.D.
EDITOR OF REVISION

ILLUSTRATED WITH COLORED PLANS, PLATES, AND ENGRAVINGS

COMPLETE IN TWELVE ROYAL OCTAVO VOLUMES

VOLUME XII

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PECULIAR PHONETIC SYMBOLS

USED IN THE WRITING OR TRANSLITERATION OF THE DIFFERENT LANGUAGES.

ā, ē, etc.: long vowels; in the Scandinavian languages the accent (*á*, *é*, etc.) is used to denote length.

ą: a nasalized *a*; so used in the transliteration of the Iranian languages.

å: labialized guttural *a* in Swedish.

æ: open *a* of Eng. *hat*, used chiefly in O. Eng.

aí: used in Gothic to denote *e* (open), in distinction from *ái*, the true diphthong.

aú: used in Gothic to denote *o* (open), in distinction from *áu*, the true diphthong.

bh: in Sanskrit a voiced labial aspirate (cf. *ch*).

ƀ: voiced bilabial (or labio-dental?) spirant, used in discussions of Teutonic dialects.

ç: voiceless palatal sibilant, similar to Eng. *sh*, used especially in transliteration of Sanskrit.

č: frequently used, e. g. in Slavonic languages, to denote the sound of Eng. *ch* in *cheek*.

c: voiceless palatal explosive, commonly used in transliteration of Sanskrit and the Iranian languages.

ch: as used in the transliteration of Sanskrit, a voiceless palatal aspirate, an aspirate being an explosive with excess of breath; as used in German grammar, the symbol for a voiceless palatal or guttural spirant.

dh: voiced dental aspirate (cf. *ch*) in Sanskrit.

ḍ: voiced cerebral explosive, so used in transliteration of Sanskrit.

ḍh: voiced cerebral aspirate (cf. *ch*) in Sanskrit.

đ: voiced dental (interdental) spirant, equivalent to Eng. *th* in *then*; so used in the Teutonic and Iranian languages and in phonetic writing.

ë: a short open *e*, used in Teutonic grammar, particularly in writing O. H. G.

e: the short indefinite or "obscure" vowel of Eng. *gardener*; used in the reconstruction of Indo-Eur. forms, and in transliterating the Iranian languages.

gh: in Sanskrit a voiced guttural aspirate (cf. *ch*).

ǵ: voiced velar (back-guttural) explosive, used most frequently in Indo-Eur. reconstructions.

ʒ: voiced guttural (or palatal) spirant, equivalent to Mod. Greek γ, and used in transliteration of Iranian languages and O. Eng.

ḥ: a voiceless breathing, the Sanskrit *visarga*.

hw: a labialized *h*, similar to *wh* in Eng. *what*; used in transliteration of Gothic and the Iranian languages.

ḫ: voiceless guttural (or palatal) spirant, equivalent to German *ch*, and used in transliteration of the Iranian languages.

i̯: the semi-vowel *y*, or consonant form of *i*; used in phonetic writing and reconstructions of Indo-Eur. forms.

j: in the transliteration of Sanskrit and the Iranian languages a voiced palatal explosive; in the Teutonic languages a semi-vowel (= *y*), for which in Indo-Eur. reconstructions *i* is generally used.

jh: in Sanskrit a voiced palatal aspirate (cf. *ch*).

kh: in Sanskrit a voiceless guttural aspirate (cf. *ch*).

ł: the guttural ("thick" or "deep") of the Slavonic and some of the Scandinavian languages.

l̥: vowel *l*; used in transliterating Sanskrit, in reconstructing Indo-Eur. forms, and in other phonetic writing.

n̥: nasal vowel; used in reconstruction of Indo-Eur. forms and in phonetic writing.

ṇ: in Sanskrit the cerebral nasal.

ñ: in Sanskrit the guttural nasal (see following).

ŋ: the guttural nasal, equivalent to Eng. *n* in *longer*; used in transliteration of Iranian languages.

ñ: palatal nasal, similar to *gn* in Fr. *regner*; used in transliterating Sanskrit and in phonetic writing.

ö: palatalized *o*; used in German and in phonetic writing.

ǫ: short open *o* in Scandinavian.

ø: short palatalized *o* (ö) in Scandinavian.

ph: in Sanskrit, voiceless labial aspirate (cf. *ch*).

ḳ: voiceless velar (back-guttural) explosive; used in reconstructions of Indo-Eur. forms and in other phonetic writing.

r̥: vowel *r*; used in transliterating Sanskrit, in reconstructions of Indo-Eur. forms, and in other phonetic writing.

š: voiceless cerebral sibilant, equivalent to Eng. *sh*; used in transliterating the Iranian languages and in phonetic writing.

ṣ: voiceless cerebral spirant; used in transliterating Sanskrit.

th: in Sanskrit a voiceless dental aspirate (cf. *ch*).

ṭh: in Sanskrit a voiceless cerebral aspirate (cf. *ch*).

ṭ: in Sanskrit a voiceless cerebral explosive.

ţ: a form of dental spirant used in transliterating the Iranian languages (represented in Justi's transliteration by ṭ).

þ: voiceless dental (interdental) spirant, equivalent to Eng. *th* in *thin*; used in Teutonic dialects and in phonetic writing.

u̯: consonant form of *u*; used in phonetic writing.

ž: voiced cerebral sibilant, equivalent to *s* in Eng. *pleasure*, and to *j* in Fr. *jardin*; used in Iranian, Slavonic, and in phonetic writing.

ẓ: a symbol frequently used in the writing of O. H. G. to indicate a voiced dental sibilant (Eng. *z*), in distinction from *z* as sign of the affricata (*ts*).

EXPLANATION OF THE SIGNS AND ABBREVIATIONS USED IN THE ETYMOLOGIES.

>, yielding by descent, i. e. under the operation of phonetic law.
<, descended from.
=, borrowed without change from.
: , cognate with.
+, a sign joining the constituent elements of a compound.
*, a sign appended to a word the existence of which is *inferred.*

ablat.	ablative
accus.	accusative
adjec.	adjective
adv.	adverb
cf.	compare
conjunc.	conjunction
deriv. of	derivative of
dimin.	diminutive
fem.	feminine
genit.	genitive
imper.	imperative
impf.	imperfect
indic.	indicative
infin.	infinitive
masc.	masculine
nomin.	nominative
partic.	participle
perf.	perfect
plur.	plural
prep.	preposition
pres.	present
pron.	pronoun
sc.	scilicet, supply
sing.	singular
subst.	substantive
vocat.	vocative

Anglo-Fr.	Anglo-French
Arab.	Arabic
Avest.	Avestan
Dan.	Danish
Eng.	English
Fr.	French
Germ.	German
Goth.	Gothic
Gr.	Greek
Heb.	Hebrew
Icel.	Icelandic
Ital.	Italian
Lat.	Latin
Lith.	Lithuanian
Mediæv. Lat.	Mediæval Latin
Mod. Lat.	Modern Latin
M. Eng.	Middle English
M. H. Germ.	Middle High German
O. Bulg.	Old Bulgarian (= Church Slavonic)
O. Eng.	Old English (= Anglo-Saxon)
O. Fr.	Old French
O. Fris.	Old Frisian
O. H. Germ.	Old High German
O. N.	Old Norse
O. Sax.	Old Saxon
Pers.	Persian
Portug.	Portuguese
Prov.	Provençal
Sanskr.	Sanskrit
Sc.	Scotch
Span.	Spanish
Swed.	Swedish
Teuton.	Teutonic

KEY TO THE PRONUNCIATION.

aa..... as *a* in *father*, and in the second syllable of *armada*.

aă..... same, but less prolonged, as in the initial syllable of *armada*, *Arditi*, etc.

a..... as final *a* in *armada*, *peninsula*, etc.

ă..... as *a* in *fat*, and *i* in French *fin*.

ay or ā.. as *ay* in *nay*, or as *a* in *fate*.

ăy or ă.. same, but less prolonged.

ä..... as *a* in *welfare*.

aw..... as *a* in *fall*, *all*.

ee..... as in *meet*, or as *i* in *machine*.

ĕe..... same, but less prolonged, as final *i* in *Arditi*.

e..... as in *men*, *pet*.

e..... obscure *e*, as in *Bigelow*, and final *e* in *Heine*.

ė..... as in *her*, and *eu* in French *-eur*.

i..... as in *it*, *sin*.

ī..... as in *five*, *swine*.

ĭ..... same, but less prolonged.

ō..... as in *mole*, *sober*.

ŏ..... same, but less prolonged, as in *sobriety*.

o..... as in *on*, *not*, *pot*.

oo..... as in *fool*, or as *u* in *rule*.

ŏo..... as in *book*, or as *u* in *put*, *pull*.

oi..... as in *noise*, and *oy* in *boy*, or as *eu* in German *Beust*.

ow..... as in *now*, and as *au* in German *haus*.

ö..... as in *Göthe*, and as *eu* in French *neuf*, *Chintreuil*.

ŭ..... as in *but*, *hub*.

ŭ..... obscure *o*, as final *o* in *Compton*.

ü..... as in German *süd*, and as *u* in French *Buzançais*, *vu*.

y or *l*.... see *l* or y.

yu..... as *u* in *mule*.

yŭ..... same, but less prolonged. as in *singular*.

*c*h..... as in German *ich*.

g..... as in *get*, *give* (never as in gist, congest).

hw..... as *wh* in *which*.

*k*h..... as *ch* in German *nacht*, *g* in German *tag*, *ch* in Scotch *loch*, and *j* in Spanish *Badajos*, etc.

ṅ..... nasal *n*, as in French *fin*, *Bourbon*, and nasal *m*, as in French *nom*, Portuguese *Sam*.

ñ or n-y.. Spanish *ñ*, as in *cañon*, *piñon*, French and Italian *gn*, etc., as in *Boulogne*.

l or y.... French *l*, liquid or mouillé, as (-i)ll- in French *Baudrillart*, and (-*i*)*l* in *Chintreuil*.

th..... as in *thin*.

th..... as in *though*, *them*, *mother*.

v..... as *w* in German *zwei*, and *b* in Spanish *Cordoba*.

sh..... as in *shine*.

*z*h..... as *s* in pleasure, and *j* in French *jour*.

All other letters are used with their ordinary English values.

NOTE.

The values of most of the signs used in the above Key are plainly shown by the examples given. But those of ö, ü, *c*h, *k*h, ñ, and *v*, which have no equivalents in English, can not be sufficiently indicated without a brief explanation, which is here given.

ö. The sound represented by this symbol is approximately that of -u- in *hurt* or -e- in *her*, but is materially different from either. It is properly pronounced with the tongue in the position it has when ä is uttered and with the lips in the position assumed in uttering ō.

ü. This vowel is produced with the lips rounded as in uttering oo and with the tongue in the position required in uttering ee, into which sound it is most naturally corrupted.

*c*h and *k*h. These are both rough breathings or spirants made with considerable force, *c*h being made between the flat of the tongue and the hard palate, and *k*h between the tongue and the soft palate. *c*h approaches in sound to English sh, but is less sibilant and is made further back in the mouth; *k*h is a guttural and has a hawking sound.

l or y. These are both used to represent the sound of French l mouillé, in (-i)ll- and (-i)l. which resembles English -y- in *lawyer*. Final *l*, that is, (-i)l, may be approximated by starting to pronounce lawyer and stopping abruptly with the -y-.

ñ or n-y. The consonants represented by ñ (Spanish ñ, French and Italian gn, etc.) are practically equivalent to English -ni- or -ny- in bunion, bunyon, onion, etc., and, except when final, are represented by n-y. Final ñ, as French -gn(e), may be produced by omitting the sound of -on in the pronunciation of *onion*.

v. This may be pronounced by attempting to utter English v with the use of the lips alone.

See PREFACE (vol. i., p. xli.) and the article PRONUNCIATION OF FOREIGN NAMES.

THE UNIVERSAL CYCLOPÆDIA.

ybee' Island: an island in Chatham co., Ga., lying off the entrance to Savannah river. The island is 6 miles long and 3 wide, and is separated from the other coast islands by Lazaretto creek. At its northeastern end stands Tybee lighthouse, 134 feet high, of brick, showing at a height of 150 feet above the sea a fixed white dioptric light of the first order, visible for 18 nautical miles; lat. 32° 1′ 20″ N., lon. 80° 50′ 31″ W. Tybee island has become historic as the site of the batteries by which Gen. Gillmore breached Fort Pulaski on Cockspur island Apr. 11, 1862. See BOMBARDMENT.

Tyche: anglicized form of the Greek name for FORTUNA (*q. v.*).

Tycho Brahe: See BRAHE.

Tycoon, or **Taikun** [literally, great prince]: the name by which the shogun of Japan was known to foreigners in the days of Japan's early intercourse with foreign nations. See SHOGUN.

Tydides: See DIOMEDES.

Tyler: city. See the Appendix.

Tyler, BENNET, D. D.: theologian; b. in Middlebury, Conn., July 10, 1783; graduated at Yale College 1804; studied theology; was pastor of the Congregational church at South Britain, Conn., 1808–22; president of Dartmouth College 1822–28; pastor of the Second Congregational church at Portland, Me., 1828–33; was the leader of the opposition to the theological views taught at Yale Theological Seminary known as the "New Divinity" (see TAYLOR, NATHANIEL WILLIAM, D. D.), and in 1834 became president and Professor of Christian Theology at the new seminary founded at East Windsor, Conn., by the "Pastoral Union" of churches in Connecticut—a post he retained until his death at South Windsor, May 14, 1858. He was author of *A History of the New Haven Theology, in Letters to a Clergyman* (1837); *A Review of Day on the Will* (1837); *Memoir of Rev. Asahel Nettleton, D. D.* (1844); *The Sufferings of Christ confined to his Human Nature* (1845); *The Doctrine of Perseverance of the Saints*; *The New England Revivals* (1846); *Letters to Dr. Bushnell on Christian Nurture* (1847–48).

Tyler, DANIEL: soldier; b. in Brooklyn, Conn., Jan. 7, 1799; graduated at the U. S. Military Academy July, 1819, when commissioned second lieutenant light artillery; served at the artillery school of practice 1824–27; on professional duty in France; on ordnance duty 1830–34; resigned from the army May 31, 1834, and became a civil engineer, being president and constructing engineer of various railroads until the outbreak of the civil war. On Apr. 23, 1861, he was appointed colonel First Connecticut Volunteers, which regiment he led to Washington, and the next month was commissioned brigadier-general of Connecticut volunteers. He was in command of a division at the action of Blackburn's Ford, July 18, and in the battle of Bull Run, July 21. Mustered out Aug. 11, 1861, he was reappointed brigadier-general U. S. Volunteers Mar. 13, 1862. He was an active participant in the Mississippi campaign, and took part in the advance upon and siege of Corinth. June 15–26, 1863, he was in command of the Federal forces at Harper's Ferry and Maryland Hills when the Confederate army had invaded Pennsylvania. He resigned his commission Apr. 6, 1864, and soon afterward took up his residence at Red Bank, N. J. He was somewhat interested in railways and manufacturing business. D. in New York, Nov. 30, 1882.

Tyler, JOHN: tenth President of the U. S.; b. in Charles City co., Va., Mar. 29, 1790; graduated at William and Mary College 1807; studied law; was admitted to the bar 1809; was a member of the State Legislature 1811–16 and 1823–25, and of Congress 1816–21; voted for the resolutions of censure on Gen. Jackson's conduct in Florida; opposed the U. S. Bank, the protective policy, and internal improvements by the national Government; was Governor of Virginia 1825–27, U. S. Senator 1827–36; opposed the administration of Adams and the Tariff Bill of 1828; made a three days' speech against a protective and in favor of a revenue tariff 1832; condemned the nullification measures of South Carolina in that year, but opposed Jackson's proclamation, and was the only Senator who voted against the "Force" Bill for the repression of that incipient secession; afterward voted for Clay's Compromise Bill, and his resolutions censuring President Jackson for the removal of the deposits 1835, as being an unwarrantable act, although at the same time believing the U. S. Bank unconstitutional; resigned his seat in the Senate Feb., 1836, in consequence of the vote of the Virginia Legislature instructing him to vote for expunging those resolutions from the Senate journal; took up his residence at Williamsburg; was regarded as a martyr to the Whig cause, and being in consequence supported in the campaign of 1836 for the vice-presidency by many Whigs, received forty-seven electoral votes; sat in the Virginia Legislature as a Whig 1839–40; was a member of the national Whig convention which met at Harrisburg, Pa., Dec. 4, 1839, by which he was nominated for the vice-presidency on the ticket headed by Gen. Harrison; was elected Vice-President Nov., 1840; inaugurated Mar. 4, 1841; succeeded to the presidency on the death of Gen. Harrison Apr. 4; retained in office the cabinet of his predecessor; issued an inaugural address Apr. 9, 1841; expressed in a message to Congress, which met in extra session May 31, 1841, his readiness to concur in any financial system not violative of the Constitution, and proposed through Mr. Ewing the outlines of a plan requiring the consent of the States to the establishment of branch banks within their limits; vetoed the bill substituted by Clay expressly striking out this requirement; vetoed a second bill called the Fiscal Corporation Bill, which claimed for Congress a similar power to establish corporations in the States; was abandoned by the members of his cabinet except Daniel Webster, who stated in a public letter that he saw no reason for his colleagues' deserting their offices; filled their places with States-rights Whigs who were opposed to the kind of bank demanded by Henry Clay; negotiated through Webster the Ashburton Treaty, fixing the Northeast boundary for 2,000 miles, and containing other important provisions (Aug. 9, 1842); made several changes in his cabinet in 1843; after two vetoes obtained the enactment of the tariff of 1842; asserted the independence of the Hawaiian islands, and caused through Caleb Cushing the first treaty to be negotiated with China; for four years conducted the whole

financial operations of the Union, Congress having repealed all laws providing for the public funds and refused to adopt the so-called "exchequer system" proposed by the President; suppressed Dorr's rebellion, and brought the exhausting war with the Florida Indians to a close; concluded through Upshur and Calhoun a treaty for the annexation of Texas (Apr. 12, 1844), and when this was rejected by the Senate effected his object by the passage of the joint resolutions of Mar. 1, 1845; was nominated for the presidency by a convention of States-rights Whigs held at Baltimore in May, 1844, but soon withdrew from the canvass after forcing the Democratic convention, which met the same day, to nominate James K. Polk, an advocate of his favorite measure, the annexation of Texas; was succeeded Mar. 4, 1845, by James K. Polk, and lived in retirement until Jan., 1861, when he presided over the peace convention, which he suggested as a means to preserve the Union; voted for secession in the Virginia State convention; was elected to the Provisional Congress of the Confederate States, and in Nov., 1861, to the House of Representatives of the Confederate States. He married in 1813 Letitia Christian, who died at Washington in 1842, and he contracted a second marriage, June 26, 1844, with Julia Gardiner, of New York. He died at Richmond, Jan. 18, 1862.

Revised by L. G. Tyler.

Tyler, Lyon Gardiner, M. A., LL. D.: educator; b. at Sherwood Forest, Charles City co., Va., Sept., 1853; educated at the University of Virginia; Professor of Belles-lettres, William and Mary College, 1877–79; principal Memphis Institute 1879–82; began the practice of law in Richmond 1882; member of the Virginia House of Delegates 1887–88; became president William and Mary College 1888; author of *The Letters and Times of the Tylers* (2 vols., Richmond, 1883–84); *Parties and Patronage in the United States* (New York, 1890). He is the son of President John Tyler by his second wife, Julia Gardiner. C. H. T.

Tyler, Moses Coit, LL. D., L. H. D.: educator; b. at Griswold, Conn., Aug. 2, 1835; graduated at Yale College 1857; studied theology there and at Andover, Mass.; pastor First Congregational church, Poughkeepsie, N. Y., 1860–62; resided in England 1863–67. In 1867 he was appointed to the chair of English at the University of Michigan, and in 1881 to that of American History at Cornell. In 1881 he was ordained deacon in the Protestant Episcopal church, and in 1883 priest. He was author of *The Brawnville Papers* (Boston, 1869), a volume of essays on physical culture; *A History of American Literature during the Colonial Time* (2 vols., New York, 1878); *A Manual of English Literature*, jointly with Henry Morley (New York, 1879); *Patrick Henry* (in the American Statesmen Series, Boston, 1887); *Three Men of Letters* (biographical and critical monographs on Berkeley, President Dwight, and Joel Barlow, New York, 1894); and *A Literary History of the American Revolution* (in press, 1895). During his early residence in England he was a frequent contributor to *The Independent* and especially to *The Nation*, and one of his articles in the latter on *American Reputations in England* was reprinted in a volume entitled *Essays from the Nation*. He contributed important articles in more recent years to various other periodicals. D. Dec. 28, 1900. H. A. Beers.

Tyler, Ransom Hebbard: author and jurist; b. in Leyden, Mass., Nov. 18, 1813; removed to New York with his parents in early youth; studied law and was admitted to the bar, taking up the practice of law at Fulton, N. Y. He was elected and appointed to various local offices, including those of district attorney and county judge of Oswego County; traveled extensively abroad, and also devoted much time to literature. D. at Fulton, N. Y., Nov. 27, 1881. He edited the Oswego *Gazette*, and published *The Bible and Social Reform, or the Scriptures as a Means of Civilization* (1863); *American Ecclesiastical Law* (including the law of burial-grounds, 1866); *Commentaries on the Law of Infancy, including Guardianship and the Custody of Infants and the Law of Coverture, embracing Dower, Marriage, and Divorce* (1868); *Treatise on the Law of Boundaries and Fences*; *Treatise on the Law of Fixtures* (1877); *Treatise on the Law of Usury, Pawns or Pledges, and Maritime Loans* (1873); *Treatise on the Remedy by Ejectment and the Law of Adverse Enjoyment* (1871); besides many short articles in magazines. F. Sturges Allen.

Tyler, Robert Ogden: soldier; b. in Greene co., N. Y., Dec. 22, 1831; graduated at the U. S. Military Academy July 1, 1853, when commissioned brevet second lieutenant of artillery, reaching the grades of first lieutenant Sept. 1, 1856, and captain and quartermaster U. S. army May 17, 1861. After a year passed in garrison he joined Col. Steptoe's command, which marched from St. Louis to Washington Territory, 1854–55, Tyler taking post at San Francisco; engaged in the Yakima (1856) and the Spokane (1858) expeditions, participating in the actions of the Four Lakes, Spokane Plains, and Spokane river; transferred to Fort Ridgely, Minnesota, 1859, and New York harbor 1860; engaged in the civil war on the expedition for relief of Fort Sumter Apr., 1861; in reopening communications with Washington viâ Baltimore May, 1861; as dépôt quartermaster at Alexandria May–Sept., when appointed colonel Fourth Connecticut Volunteers, and in command of his regiment (known as the First Connecticut Heavy Artillery after Jan., 1862) in the defenses of Washington until the spring of 1862; in the Virginia Peninsular campaign in command of siege-batteries before Yorktown; in battles of Hanover Court-house, Gaines's Mill, and Malvern Hill. He was promoted brigadier-general of volunteers Nov. 29, 1862, and engaged in the battle of Fredericksburg, Dec. 13, in command of the artillery of Sumner's grand division; of the artillery reserve of the Army of the Potomac at Chancellorsville, Gettysburg, and subsequent operations, until Jan., 1864; of division of Twenty-second Army-corps, covering Washington and lines of communications of the Army of the Potomac, Jan.–May, 1864; of division of heavy artillery, Second Corps, in the Richmond campaign of 1864, from the Wilderness battles to Cold Harbor, where he was severely wounded June 1, and disabled for further duty in the field. He commanded various departments from Dec., 1864, to June, 1866, when he resumed quartermaster duty, in which department he became lieutenant-colonel and deputy quartermaster-general July, 1866, serving thereafter in San Francisco, New York, Boston, and elsewhere. He was breveted from major to major-general in the U. S. army for gallantry in action. D. in Boston, Mass., Dec. 1, 1874.

Revised by James Mercur.

Tyler, Royall: jurist and author; b. in Boston, Mass., July 18, 1757; graduated at Harvard 1776; studied law under John Adams; was for a short time during the war of the Revolution aide to Gen. Lincoln, which post he also filled during the Shays rebellion 1786; settled at Guilford, Vt., 1790; was judge of the Vermont Supreme Court 1794–1800, and chief justice 1800–06; published *Reports of Cases in the Supreme Court of Vermont* (New York, 2 vols., 1809–10). D. at Brattleboro, Vt., Aug. 16, 1826. He was one of the earliest American dramatists, enjoyed a high reputation as a wit, and was quite successful in the introduction in comedy of Yankee dialect and of humorous stories. Among his pieces were *The Contrast* (1790), produced Apr., 16, 1787, at the John Street theater, in New York, the first American comedy regularly presented by a company of professional actors; *May Day, or New York in an Uproar*, produced May, 1787; and *The Georgia Spec, or Land in the Moon*, produced 1797. He was a leading contributor of humorous verse and prose to Joseph Dennie's papers, *The Farmer's Weekly Museum* (Walpole, N. H., 1795–99) and *The Portfolio* (Philadelphia, 1801, *seq.*); wrote also for *The New England Galaxy*, *The Columbian Centinel*, *The Polyanthos*, and other literary journals, and was author of a Crusoe-like novel, *The Algerine Captive, or the Life and Adventures of Dr. Updike Underhill, Six Years a Prisoner among the Algerines* (Walpole, 2 vols., 1797); besides *Moral Tales for American Youths* (1800) and *The Yankey in London* (1809).

Revised by H. A. Beers.

Tyler, Samuel, LL. D.: author and lawyer; b. in Prince George co., Md., Oct. 22, 1809; educated at Georgetown, D. C., where he paid especial attention to Greek; afterward studied at Middlebury College, Vermont, 1827; studied law; admitted to the bar at Frederick City in 1831; in 1850 appointed one of three commissioners to simplify the pleadings and practice in all the courts of the State, and prepared a *Report*, which contained a learned comparison of the common law and the civil law; resided for some years in Washington, D. C.; was connected as professor with the law department of the Columbian University; wrote chiefly on metaphysics, in which branch his labors received commendation from Sir William Hamilton and other competent critics. D. at Georgetown, D. C., Dec. 15, 1877. Author of *A Discourse on the Baconian Philosophy* (1844); *Burns as a Poet and as a Man* (1848); *The Progress of Philosophy in the Past and in the Future* (1859; 2d ed. 1868); and a

Memoir of Roger Brooke Taney (1872); *Commentary on the Law of Partnership* (1877); and editor of *Gilbert's History of the Law of Chancery* and *Mitford's Chancery Pleading.* Revised by F. STURGES ALLEN.

Tyler, WILLIAM SEYMOUR, D. D., LL. D.: educator; b. at Harford, Pa., Sept. 2, 1810; graduated at Amherst College 1830; taught classics in Amherst Academy 1830–31; was tutor in Amherst College 1832–34; studied theology at Andover Seminary; was in 1836 licensed to preach, but not ordained until many years later (1859), in consequence of his acceptance of the professorship of Greek and Latin at Amherst College; became Graves Professor of Greek (1847) on the division of the professorial chair; visited Europe and the East 1855, and Greece and Egypt 1869. He has published *The Germania and Agricola of Caius Cornelius Tacitus* (New York, 1847; enlarged eds. 1852 and 1878), with notes and a *Life; The Histories of Tacitus* (1849); *Prayer for Colleges* (1855; several eds.), a prize essay; *Memoir of Rev. Henry Lobdell, M. D., Missionary at Mosul* (Boston, 1859); *Plato's Apology and Crito* (1860); *The Theology of the Greek Poets* (1867); *The History of Amherst College* (Springfield, 1873); *Demosthenes de Corona* (Boston, 1874); *The Olynthiacs and Philippics of Demosthenes* (1875); and nine books of the *Iliad* (New York, 1886); besides numerous commemorative discourses, and contributions to reviews and cyclopædias, and to the *Transactions* of the American Philological Association.

Tylor, EDWARD BURNETT, D. C. L., LL. D., F. R. S.: anthropologist; b. at Camberwell, London, England, Oct. 2, 1832. He was educated at the Friends' School, Tottenham. In 1856 he went to Mexico in company with Henry Christy, and made an extended exploration of the antiquities, etc. The results of this journey were published with the title *Anahuac, or Mexico and the Mexicans* (1861), which has been much praised for the accuracy of its descriptions. Other important works by him are *Primitive Culture* (1871) and *Anthropology* (1881). In 1888 he was named Gifford lecturer at Aberdeen University, and in 1891 he was president of the Anthropological Society. H. H. S.

Tylpinus: see TURPIN.

Tym'panum [= Lat. = Gr. τύμπανον, drum, kettledrum, deriv. of τύπτειν, strike]: a sort of drum or hollow organ constituting the middle ear in man, containing air, and through its middle a small chain of bones—the malleus, or hammer-bone, the incus, or anvil, and the stapes, or stirrup. See EAR.

Tyn'dale, or **Tindale**, WILLIAM: translator of the New Testament; b. perhaps at Hunt's Court, North Nibley, or perhaps at Melksham Court, both in Gloucestershire, England, about 1484; studied at Magdalen Hall, Oxford, where he graduated B. A. 1512; removed to Cambridge, probably because Erasmus was there (1510–14); took holy orders; left Cambridge 1521; resided as a chaplain and tutor in the family of Sir John Welsh, of Little Sodbury, near Bristol, incurring danger by his advocacy of the doctrines of Luther, then recently proclaimed, on which account he was cited before the chancellor of the diocese of Worcester 1522; translated into English the *Enchiridion Militis*, or *Soldier's Manual*, of Erasmus; went to London 1523; made an unsuccessful application for admission into the household of Bishop Tunstall; was protected for some months in the family of Alderman Humphrey Monmouth, who gave him £10 per annum to prosecute his theological studies in Germany, on condition of praying at stated periods for the souls of the alderman's parents; went to Hamburg Jan., 1524; thence to Wittenberg; to Cologne, 1525. He engaged in the translation of the New Testament into English, with the aid of John Frith and William Roye, the printing of which at Cologne in the office of Peter Quentell (quarto, 1525) was interrupted by the vigilance of Cochlæus; completed the printing at Worms in the office of Peter Schoeffer; issued in 1526 a new octavo edition of the whole work, which obtained a wide though secret circulation in England, being prohibited by an edict of Tunstall, Bishop of London, who bought up the remainder of the edition at Antwerp and burned them at Cheapside 1529; removed to Marburg, and published there his *Obedience of a Christian Man* (1528); had an interview with Coverdale at Hamburg, and issued a fifth edition of the Testament 1529; published his translation of the Pentateuch, "emprented at Marlborow [Marburg] in the Land of Hesse," 1520; had a bitter controversy with Sir Thomas More, who in a witty and abusive pamphlet denounced the translation and its author 1529; was treacherously invited to return to England in order to seize his person—an artifice to which his assistant, John Frith, fell a victim, being burned at the stake 1533; brought out a revised and corrected edition, the first to which he put his name, 1534; wrote several doctrinal treatises and introductions, expositions, and notes to various books of the Bible; resided during his later years at Antwerp; was arrested 1535 on a charge of heresy through the agency of an emissary of Henry VIII. acting in concert with the clergy and magistrates of Brussels; imprisoned in the castle of Vilvorde, Brabant, near Brussels; tried by virtue of a decree of Charles V., issued at Augsburg 1530, and the University of Louvain having urged his condemnation, with the eager approval of Henry VIII., he was convicted, after eighteen months' imprisonment, during which he translated from Joshua to 1 Chronicles, inclusive; these translations, along with his Pentateuch and Jonah, were published in Matthew's Bible (1537). He was strangled and burned at the stake at Vilvorde, Oct. 6, 1536. He met his fate with composure, his last words being a prayer, "Lord, open thou the King of England's eyes." The spot where he suffered is shown near the new penitentiary at Vilvorde. A monument to his memory was erected at Nibley Noll, Nov., 1866. His translation of the New Testament is the basis of the Authorized Version, and is executed with considerable accuracy and elegance, and also with independence; his translations from the Old Testament show clearly dependence upon Luther. His works were published London, 1573, and by the Parker Society (3 vols., 1848–50); his Pentatench was reprinted by Rev. Jacob I. Mombert (New York, 1884); his New Testament has been several times reprinted. A beautiful edition, with a *Memoir of Tyndale's Life and Writings*, by George Offor, was published by S. Bagster (London, 1836), and reprinted at Andover, Mass., 1837; but the best *Life* is by R. Demaus (London, 1871; rev. by R. Lovett, 1886). Revised by S. M. JACKSON.

Tyndall, JOHN: physicist; b. at Leighlin Bridge, near Carlow, Ireland, Aug. 21, 1820. He received a sound education in English and mathematics, and in 1839 became civil assistant to a division of the ordnance survey. He was a railway engineer at Manchester from 1844 to 1847, when he became a teacher of physics at Queenwood College, Hampshire, where Dr. Edward Frankland was resident chemist. In 1848 he and Frankland went to Germany, and attended Bunsen's and Knoblauch's lectures at Marburg. Tyndall worked in the laboratory in conjunction with Knoblauch, and made discoveries in magnetism, which he embodied in a paper published in *The Philosophical Magazine* in 1850. He graduated in 1851, presenting for his doctorate a thesis on screw surfaces, and afterward continued his studies under Magnus in Berlin. He returned to England, where he published the results of his experiments, which led to his being elected in 1852 a fellow of the Royal Society. In 1853, on the proposal of Faraday, he was elected Professor of Natural Philosophy at the Royal Institution, of which he was made superintendent in 1867. In 1856, with Prof. Huxley, he visited Switzerland, where he distinguished himself by being the first to climb the Weisshorn, and by his observations on the structure and motion of glaciers. Subsequently he reached the summit of the Matterhorn, crossing it from Breuil to Zermatt, and from 1856 until his death no year passed without a visit to the Alps. The results of this and later Swiss experiences he published in the *Philosophical Transactions*, in *Glaciers of the Alps* (1860), *Mountaineering in 1861* (1862), and *Hours of Exercise in the Alps* (1871). In 1859 he began his important investigations on radiant heat, the results of which he described in his lectures at the Royal Institution in 1862, in *Heat considered as a Mode of Motion* (1863), and in the Rede lecture *On Radiation* (1865). Later he studied the acoustic properties of the atmosphere and the subject of spontaneous generation, discovering in 1869 a very precise method of determining the absence or presence of particles of dust in the air. Several of his results were embodied in his lecture *Dust and Disease* (1870). (See *The Nineteenth Century*, Jan., 1878.) In 1872 he visited the U. S. on a successful lecturing tour, the profits of which he placed in the hands of an American committee as a fund "in aid of students who devote themselves to original research." He received honorary degrees from the Universities of Cambridge and Edinburgh, and was made a D. C. L. by the University of Oxford, in spite of the protest of Dr. Heurtley, Margaret Professor of Divinity, who alleged that Tyndall

had signalized himself by writing against and denying the credibility of miracles and the efficacy of prayer, etc. In 1874 he was president of the British Association in its meeting at Belfast, when his address excited a keen controversy, in consequence of its being the first clear and unmistakable utterance as to the aims of modern science, and its apparent assertion of materialistic opinions, as for instance in the statement that he found in matter "the promise and potency of every form and quality of life." In 1883 he retired from several appointments, and in 1887 was succeeded as professor at the Royal Institution by Lord Rayleigh. Toward the close of his life he took a somewhat prominent part in opposing Gladstone's scheme of Home Rule for Ireland. D. at Haslemere, Surrey, from an overdose of chloral accidentally administered by his wife, Dec. 4, 1893. Tyndall's eminence did not arise especially from his scientific discoveries, but rather from his force of character, his uncompromising love of truth, his unrivaled grasp of his materials, and his power as a brilliant and effective exponent of physical science, both in his public lectures and in his writings, which are remarkable for their literary merit. Besides the works previously mentioned, he published *Sound, a Course of Eight Lectures* (1867; 3d ed., enlarged, 1875); *Faraday as a Discoverer* (1868; 4th ed. 1884); *Natural Philosophy in Easy Lessons* (1869); *Nine Lectures on Light* (1870); *Researches on Diamagnetism and Magneto-crystallic Action* (1870); *Seven Lectures on Electrical Phenomena and Theories* (1870); *Essays on the Use and Limit of the Imagination in Science* (1871); *Fragments of Science for Unscientific People* (1871; 8th ed. 1892); *The Forms of Water in Clouds and Rivers, Ice and Glaciers* (1872, being vol. i. of the International Scientific Series); *Contributions to Molecular Physics in the Domain of Radiant Heat* (1872); *Essays on the Floating Matter of the Air* (1881); and *New Fragments* (1892). R. A. ROBERTS.

Tyne: river of Northern England; formed by the junction of the North and South Tyne. It flows eastward, and enters the North Sea after a course of 30 miles through the richest mining districts of England. Its chief tributaries are the Derwent and the Team. It is navigable 18 miles from the North Sea.

Tynemouth: town; in Northumberland, England; at the mouth of the Tyne; 9 miles E. of Newcastle (see map of England, ref. 3–H). Tynemouth is a well-built town, and is the chief watering-place of Northumberland. It has a pier half a mile long, completed in 1892, and a lighthouse situated on the cliffs above. The municipal and parliamentary borough, returning one member, includes North Shields (see SHIELDS) and several other townships. Pop. (1891) 46,267.

Tyng, STEPHEN HIGGINSON, D. D.: clergyman; b. at Newburyport, Mass., Mar. 1, 1800; son of Hon. Dudley Atkins (1760–1829), U. S. collector at that port and reporter of the Massachusetts Supreme Court, who assumed the name of Tyng on inheriting the estate of his relative, James Tyng, of Tyngsborough; graduated at Harvard 1817; was for some time engaged in mercantile pursuits; afterward studied theology; was ordained in the Protestant Episcopal Church 1821; was minister of St. George's, Georgetown, D. C., 1821–23, of a church in St. Anne's parish, Md., 1823–29; rector of St. Paul's, Philadelphia, 1829–33, of the Church of the Epiphany, Philadelphia, 1833–45, and from 1845 to May, 1878, of St. George's, New York; traveled in Europe; edited successively *The Episcopal Recorder*, *The Theological Repository*, and *The Protestant Churchman*; author of *Lectures on the Law and Gospel* (Philadelphia, 1832); *Recollections of England* (New York, 1847); *Forty Years' Experience in Sunday-Schools* (New York, 1860); *The Prayer-Book Illustrated by Scripture* (3 series, 1863–67); *The Child of Prayer, a Father's Memorial to the Rev. Dudley A. Tyng, A. M.* (1858), and other works, theological and biographical; published several volumes of sermons and many addresses; edited with introductions or prefatory memoirs various works by other hands; was a conspicuous advocate of temperance and other reforms, and had high fame for eloquence in the pulpit and on the platform. D. at Irvington, N. Y., Sept. 4, 1885.—His son, DUDLEY ATKINS, b. in Prince George's co., Md., Jan. 12, 1825; graduated at the University of Pennsylvania 1843; studied theology at Alexandria Seminary; took orders in the Protestant Episcopal Church 1846; was assistant to his father at St. George's church, New York; had charge of parishes at Columbus, O., Charlestown, Va., and Cincinnati, O., and was rector of the Church of the Epiphany, Philadelphia, from 1854 until shortly before his death, at Brookfield, near Philadelphia, Apr. 19, 1858. He was a successful lecturer upon religious and social topics, and acquired a high reputation for ability and manliness, as well as philanthropy, by his course in preaching against slavery, which involved his dismissal from his pastorate. The hymn *Stand up for Jesus!* commemorates an incident of his deathbed. He published *Vital Truth and Deadly Error* (Philadelphia, 1852); *Children of the Kingdom, or Lectures on Family Worship* (1854), republished in England as *God in the Dwelling* (4th ed. 1859); and *Our Country's Troubles* (Philadelphia, 1856). His *Life*, as above indicated, was written by his father.—Another son, THEODOSIUS S. TYNG, is a missionary at Osaka, Japan. Revised by W. S. PERRY.

Tyng, STEPHEN HIGGINSON, Jr., D. D.: clergyman; son of Stephen H. Tyng, D. D.; b. at Philadelphia, Pa., June 28, 1839; graduated at Williams College 1858; studied at the Theological Seminary of Virginia; was ordained deacon May 8, 1861; assisted his father in the ministry of St. George's church, New York, 1861–63; was ordained priest Sept. 11, 1863; became rector of the Church of the Mediator, New York, 1863; entered the army as chaplain of the Twelfth New York Volunteers 1864; organized the parish of the Holy Trinity, New York, 1865, building on Forty-second street a church which in 1873–74 was replaced by a larger edifice; was tried in 1867 for preaching in a Methodist church in New Jersey, which was a violation of the canon law of his Church; edited 1864–70 a weekly religious journal, *The Working Church*; was noted for his cordial fellowship with evangelical churches of other denominations; took a prominent part in the revival movement of 1875 directed by Moody and Sankey, and in the summer of 1876, in combination with other clergymen, commenced out-door Sunday services for the people in a "gospel tent" erected near his church—an undertaking which proved very successful; published *The Square of Life* (New York, 1876); *He Will Come* (1877); and several volumes of sermons. He resigned the rectorship of Holy Trinity Church in 1881, and settled in Paris as manager of the interests of an insurance company. D. in Paris, Nov. 17, 1898.

Type [from Lat. *typus*, figure, image, form, type = Gr. τύπος, liter., blow, impression, mark, deriv. of τύπτειν, strike]: in theology, an image or representation prefiguring a person or thing, which then is called its antitype: thus St. Peter describes baptism as the antitype of the ark of Noah (1 Pet., iii. 21). In this sense the word is used several times in the New Testament and by Jewish historians; and several of the Fathers, especially Augustine and Gregory the Great, are very ingenious in finding types by their intrepretation of the Bible. In chemistry, types are formulas representing the composition and structure of other more complex compounds, which may then be derived from the simpler forms by substitution. They include the monovalent type HCl, the divalent type H_2O, the trivalent type H_3N, and the quadrivalent type H_4C.

Type: See PRINTING.

Type-founding: the process of casting or manufacturing type. From the discovery of printing to the middle of the sixteenth century printers cast their own type. After 1550 it became a business distinct from printing. Claude Garomond, of Paris, who began early in that century, is regarded as the father of letter-founders. He was followed by Le Bé, Sanlecque, Moreau, Fournier, Grandjean, Legrand, and others, who maintained the reputation of French type-

FIG. 1.—Letter H, from a type of canon body.

FIG. 2.—Face of the letter on the body.

FIG. 3.—View of body inclined to show the face.

founding. Bodoni (1740–1813), of Italy, the Didots, of France, and Breitkopf (1719–94), of Leipzig, are other distinguished names in the subsequent history of type-making. Great Britain imported most of its type from Holland until about 1720, when William Caslon became famous as a letter-cutter. The Caslon foundry, established in 1718 in London, is still in existence, and contains the original punches which Caslon cut. Baskerville and Wilson were other notable Brit-

ish founders. About 1735 Christopher Saur (or Sower) began printing at Germantown, Pa., and cast the type which he required, executing the second Bible printed in America, a quarto, in German, in 1743. Several unsuccessful attempts were subsequently made to establish type-foundries in America, among them one by Franklin. Binny & Ronaldson, of Edinburgh, began type-founding in Philadelphia in 1796, and, after a severe struggle and by State aid, were the first to establish a business, afterward known as the Johnson Foundry, and now carried on as the MacKellar, Smiths & Jordan branch of the American Type Founders' Company. The first type-founders of New York—Mappa, of 1793, and Robert Lothian, of 1806—were unsuccessful. Elihu White, who began in 1810, succeeded. He was followed in 1813 by the rival house of D. & G. Bruce, through whose efforts stereotyping was introduced in the U. S. There is evidence that at the beginning of the sixteenth century the apparatus for type-founding was much the same as up to the middle of the nineteenth century. In devising a new font of type the first process is to make a model in steel for each letter. Instead of cutting out the interior of the letter, a tool, called the counter-punch, is cut on steel to form the hollow or counter of the letter. The counter-punch, after hardening, is then impressed in the end of a short bar of soft steel, which is known as the punch. Around this sunken counter the model letter is cut in high relief. The punch is hardened (then resembling Fig. 5), and is punched into a flat piece of cold-rolled copper like Fig. 6, which, after careful finishing, becomes the matrix, or mother-type. The letters at the bottom of the matrix indicate the size, double english, and the number of nicks, in this case one nick. Every letter requires a separate punch and matrix. Matrixes may also be made by electrotyping from the face of the type or an engraving. The matrix is then fitted to the mould that forms the body of the letter. The hand-mould, used from the discovery of printing until recently, is composed of two parts, which fit exactly together. The external surface is of wood, the interior of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter. The caster, holding the mould in the left hand, with a small ladle containing about a spoonful pours the metal into the orifice, then jerks up the mould higher than his head to expel air and condense the metal, lowers it, opens the mould, and casts out the type. The hand-mould is now seldom used, except to cast large metal or kerned type. The type, when first thrown out, has a piece of metal attached to its base, called the jet, partly represented at the bottom of the letter H in Fig. 7. In hand-dressing this jet is broken off by boys, the sides of the type are rubbed smooth on gritstone, and the type set up in long lines. They are then dressed and finished; a groove (Fig. 4, 9) is cut in the foot of the type to remove any bit of the jet remaining. After examination with a microscope for the detection of imperfect letters, the types are ready for use.

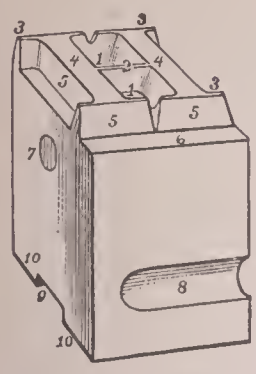


Fig. 4.—1, counter; 2, hair-line; 3, serif; 4, stem, or body-mark; 5, neck, or beard; 6, shoulder; 7, pin-mark; 8, nick; 9, groove; 10, feet.

Fig. 5. Punch.

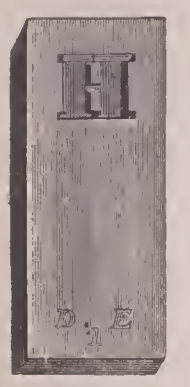


Fig. 6. Matrix.

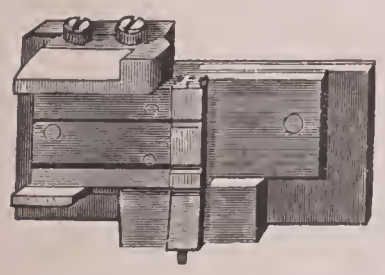


Fig. 7.—Half of machine-mould (De Vinne).

Type-casting Machines.—About 1826 William M. Johnson, of Long Island, not a founder, conceived the idea of casting type by machinery, but the types made by his machine were too light and porous. David Bruce, Jr., of New York, patented a more successful type-casting machine Mar. 17, 1838. Subsequently improved, it was put to general use in foundries in the U. S., and was slowly adopted, with modifications, by European founders. This machine is represented in Fig. 8. It consists of a small melting-pot to hold the metal, which is kept fluid by a gas-jet or small furnace. In the interior of the pot is a forcing-pump and valve that expels the metal under the piston or plunger, and prevents its return to the mass in the pot.

The valve secures the full force exerted by the plunger, which transmits it to the molten metal under it, and forces it through a narrow channel leading from the bottom of the chamber in which the plunger works to the outside of the pot, where a nipple is inserted, with a small hole through it, communicating with the narrow channel. Against this nipple the mould in which the type is formed is pressed at the moment when the plunger descends to receive the molten metal that forms the type. The type-mould, of steel, is composed of two parts, each fitting the other with great exactness. Fig. 7 represents one-half of this mould, containing a letter just cast, which shows the nicks in the letter formed by a convex ridge in the other half-mould, and the jet of surplus metal attached to the bottom of the type. The face of the letter is shown without the matrix, Fig. 6, which is properly adjusted when in position, and the mould

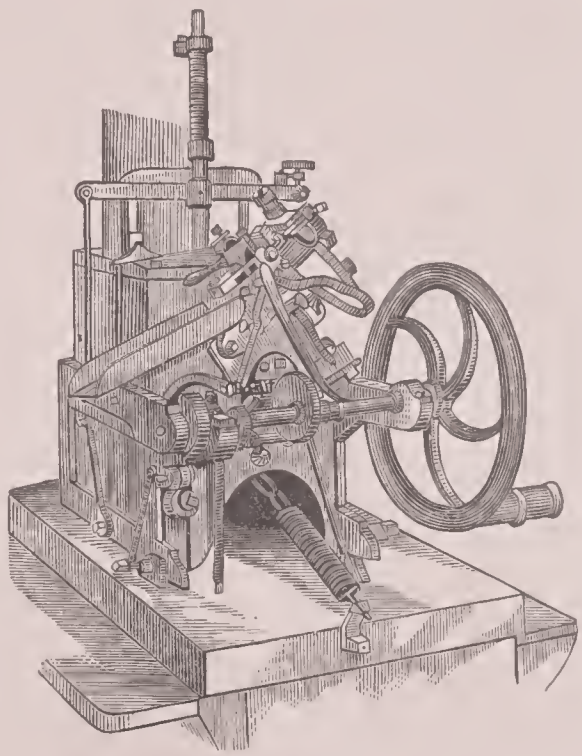


Fig. 8.—Bruce's type-casting machine.

closed. A mould is made for each body of type, and is immovable in the direction of its depth, but is made adjustable to suit the varying widths of different letters. Its immobility in one direction insures the same body for every type cast in each font. It is therefore only necessary to change the matrix for every character, instead of having a mould and matrix for the different letters. Half of the mould is attached to an oscillating arm, which carries the mould to and from the nipple in the melting-pot. The other half of the mould is attached to another arm, which is connected to the first arm, so that the two halves open and shut upon each other. The machine operates as follows: The plunger being raised in the chamber of the pump, and the chamber being supplied with metal through the valve, the mould is brought against the nipple; the valve closes to prevent the metal being forced back into the pot; the plunger descends and forces the metal through the narrow channel into the mould, the mould recedes, the halves separate, and the type is cast out. A blast of cold air is directed upon the mould to keep it cool. The types are hand-dressed as before. This machine is worked by turning a small crank-wheel. It may also be worked by steam. David Bruce, Jr., in 1868, introduced an apparatus adapted to the type-casting machine to receive the type as fast as cast, and break off the jet or stem of metal by a consecutive operation. The London Type-founding Company's machine is heated by gas, the mould is cooled by a stream of cold water, and the types when made travel into small chambers, where they are planed, smoothed, nicked, and grooved ready for use. Several machines were introduced at an early date into the U. S. to rub and dress type automatically. An important improvement is the type-casting machine of J. A.

T. Overend, of San Francisco, Cal., patented in 1875. A pump-cylinder is provided with a plunger, having a chamber in its lower end; a hole in the lower part of the cylinder allows the metal to flow in, and as the plunger closes this hole in descending, an opening in its upper part arrives opposite the discharge opening, and the liquid is forcibly ejected. A self-adjusting nozzle connects the pumps with the mould. Between the nozzle and the mould a carrier is interposed having several arms with holes. When the metal passes into the mould, it opens, and the carrier moves forward, holding the type by its stem, and places it on an inclined table. A clamp secures the type, and a sliding plate, breaking the type from its stem, forces it between rubbers, to smooth the rough edges, fitting the type for use. The stem left in the carrier is afterward forced out by a pin.

Many new forms of automatic type-casting machines have been invented since 1865. Foucher Frères, of France, Hepburn, of England, and Küstermann, of Germany, have made marked improvements, but the machine most preferred in the U. S. is that of Henry Barth, of Cincinnati, patented Jan. 24, 1888. In this machine one-half of the mould and the matrix are fixed upright and made immovable; the other half rapidly slides to and fro on broad bearings, releasing the type that has been cast, and closing again before new metal is injected in the mould. It breaks off the jet, plows a groove between the feet, rubs off the feather edges, and delivers the finished types in lines in a channel ready for inspection.

The punch-cutting machine of L. B. Benton is a more recent improvement in type-founding. It is an adaptation of the pantograph. From one pattern letter any size of punch for book letter can be made without a special drawing for each size, and all the sizes will be in exact proportion. The success of the Linotype type-making and type-composing machine is largely due to the accuracy of the matrixes made by the Benton machine-punches.

Types can be cast by many machines quicker than they can be cooled. The ordinary performance of the caster by hand was 400 in an hour; by the Bruce machine, on ordinary sizes of book type, 100 in a minute; by the newer machines and on small sizes, 140 or more in a minute.

Revised by THEODORE L. DE VINNE.

Typesetting-machines: The simplest form of typesetting-machine merely sets the types provided by founders; it does not make nor distribute the types. Nearly all the machines of this class are constructed with these features. The characters selected seldom exceed eighty-three in number. Italic, small capitals, and accents are excluded, because they are infrequent in ordinary composition; they add to the cost of the machine, and seriously diminish its performance. For each character a separate case or narrow channel of brass, about 2 feet long, is provided, in which the types are put side by side and in a nearly vertical position before the operator. The lower end of each case is connected with a lever that is moved whenever the operator touches its mated connection on the lettered keyboard. The lever so touched thrusts out the type desired into the general collecting channel. Another operator, called the justifier, takes the types in the channel and makes them up in lines of uniform length by the same methods practiced in hand typesetting. All the machine can do is to set types in a continuous line, which it does usually four or five times quicker than they can be set by hand. Spacing-out or justifying, making-up, and distribution must be done by hand, or upon machines of another kind. Of the many varieties of this form of machine but two are in practical use—the Empire and the MacMillan. A separate machine is required for the distribution of the type. Each character has cut upon its shank a distinct nick or groove, which permits its entrance only in its own channel during the operation of distribution. The MacMillan machine is also provided with a mated justifying apparatus.

In the Thorne machine the two distinct operations of setting and distributing are combined in one machine. An upright hollow, grooved cylinder of iron is divided in equal halves: the lower half contains in its grooved channels the type to be set; the upper half contains at its top the types to be distributed, which are separated and distributed down the grooved channels of the upper to those of the lower half of the cylinder. The operation of dislodging the types from this lower cylinder into a collecting channel is accomplished by peculiar devices, but the types set are arranged in a continuous line, and are spaced and justified by hand as in the Empire and MacMillan machines. The types can be set as fast as, often faster than, they can be justified.

The Mergenthaler or Linotype machine makes the type it uses, casting the letters selected by the operator, properly justified with spaces between words, in solid bars of the length

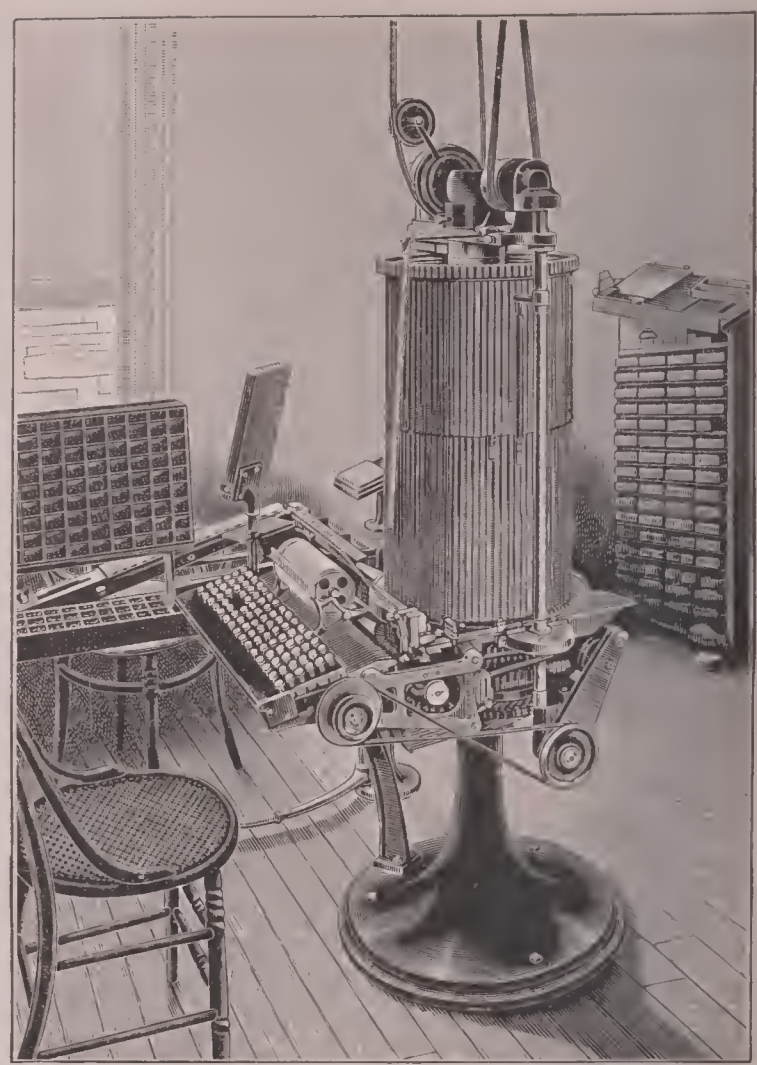


FIG. 1.—Thorne typesetting and distributing machine.

of line required. Brass matrixes are dislodged by the operator instead of types, and these are automatically arranged

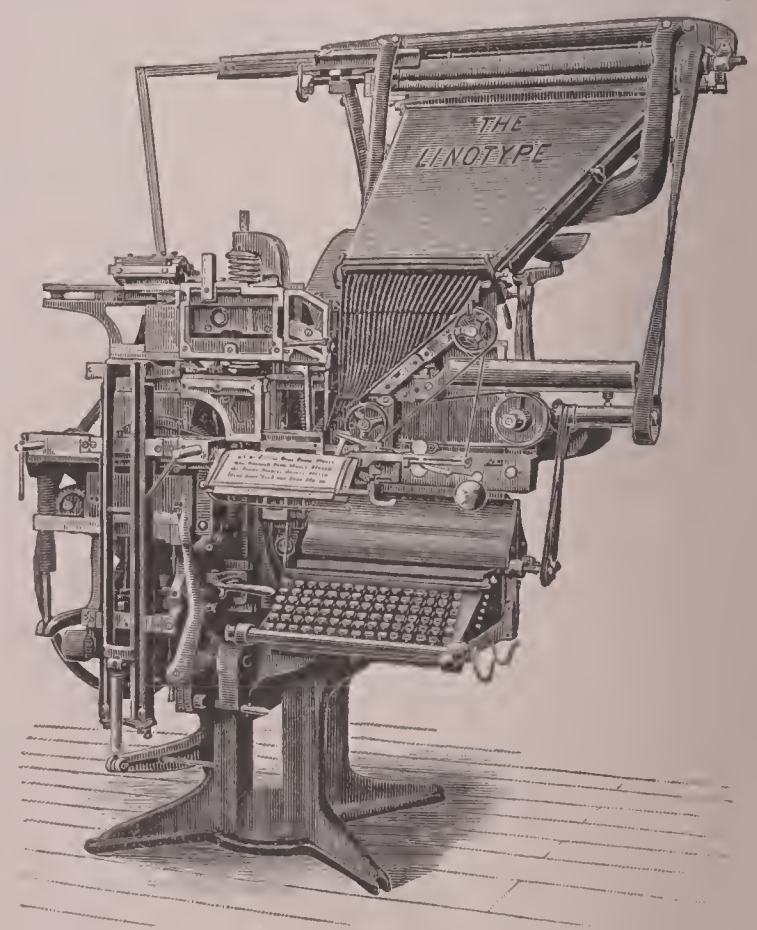


FIG. 2.—Mergenthaler linotype machine.

over the mould that forms the line. When the line is full another automatic device thrusts wedges between the words and spaces out the line. At the same instant a jet of fluid

metal, kept fluid by gas jets under the machine, is injected and thrown out of the mould as soon as it is cool enough, without delaying the work of the operator. The brass matrices are also immediately returned to their proper receptacles for future re-use. The performance of the machine is limited only by the ability of the operator. It is largely used by the daily newspapers of the U. S. and to some extent in Great Britain. The Lanston machine also casts the types it uses, not in lines, but in isolated characters. Many other forms of typesetting and distributing machines, some of high merit, have been invented, but those here described are in most use in 1895.

The first patent for a typesetting and typemaking machine was granted in England, Mar. 24, 1822, to Dr. William Church, who claimed that his apparatus would cast and compose types at the rate of 75,000 characters in one hour. It never did practical work, but many of his devices were afterward accepted by other inventors. The first practical machine in the U. S. was that of Clay and Rosenberg (British patent of 1842), but it was not approved of by printers. This was quickly followed by the simpler American machine of Mitchel, which was kept at work for many years. It failed, as did many of the early machines, for want of an equally good distributer. The names of some of the other prominent inventors are Mazzini, Goubert, Delcambre, Hattersley, Mackie, and Fraser—all holding British patents; Hensinger, of Germany; Kliegel, of Hungary; Sörensen, of Denmark; Boulé, Caillard, Simencourt, Coulon, and Beaumont, of France; Gilmer, Ray, Felt, Huston, Paige, Rogers, Alden, and Dow, of the U. S. THEODORE L. DE VINNE.

Typewriters: machines carrying types with which writing is done resembling ordinary print. The increasing production of manuscript in modern times has greatly stimulated the development of these ingenious machines. Since about 1870 they have been brought from a state of crudity to a state of perfection which compares favorably with any other mechanical device. They are now considered almost indispensable in the U. S., and their use is rapidly increasing throughout the world.

The Earliest Typewriters.—The first recorded attempt to produce a writing-machine is that of Henry Mill, an English engineer, to whom, on Jan. 7, 1714, was granted a patent for "an artificial machine or motive for impressing or transcribing of letters, singularly or progressively, one after another in writing, whereby all writings whatsoever may be engrossed on paper or parchment so neat and exact as not to be distinguished from print." This machine, however, was not perfected, and no description of it exists.

The first typewriter invented in the U. S. was termed the "Typographer," patented in 1829 by William Austin Burt, of Detroit, Mich., also inventor of the solar compass. In design and construction it was an exceedingly crude device, although it would perform writing slowly. In 1833 a French patent was granted to Xavier Progrin, of Marseilles, for a machine designed to print "almost as rapidly as one could write with an ordinary pen"; also to impress stereotype plates and to copy and stereotype music. In this device a circle of type-bars, operated by upright rods passing through the top plate, struck downward to a common center on a flat platen. It had no keyboard, and after printing each type-bar was pulled up again by the operator. The whole machine, regulated by suitable though crude mechanism, moved across the paper to provide for line and letter spacings. It was too slow and cumbersome to come into general use.

Much of the progress made in later years was due to the efforts of electricians to provide a means for printing by electricity letters or other symbols by which intelligence could be conveyed to distant places. A British patent issued to Alexander Bain and Thomas Wright, June 21, 1841, covered among other electrical contrivances a device which involves some of the principles of the modern typewriter. A series of type-bars arranged to print at a common center were moved by an electro-magnet attracting an armature on the connecting-rod until an armature on the type-bar itself came within the field of another electro-magnet located at the common center, which forced the type against an inked ribbon laid upon the surface of the paper upon which the printing was done. Another portion of the same patent described an ingenious machine with a type-wheel mounted upon a vertical shaft which was actuated by a clockwork attachment governed by an electric current. These inventors seem to have had no idea of making use of their device save for the purposes of the electric telegraph, and as such methods of telegraphy were soon superseded their invention attracted little attention. It is also known that Sir Charles Wheatstone devised a writing-machine before 1851. This, with subsequent modifications constructed 1855–60, is described in the *Journal of the Society of Arts* for Sept. 21, 1894.

The Thurber Machine.—A typewriter practical in every way except as to speed was patented by Charles Thurber, of Worcester, Mass., on Aug. 26, 1843. In actual construction the only model ever made departed quite materially from the patent. A flat horizontal wheel carried on its periphery a number of upright rods, each having a type at the lower end and a finger-key at the upper. The proper rod was moved to the printing-point by revolving the wheel, and its depression, by the aid of a permanent guide, served to imprint the character upon the right spot on the paper beneath. The paper was placed around a cylinder which was moved lengthwise step by step by means of ratchet and pawl mechanism to produce the letter-spacing, while the revolution of the cylinder produced the proper spacing between lines. The inking was accomplished by passing the face of the type across an inked roller.

The Foucault Machine.—A machine for printing embossed characters for the use of the blind was patented in France by Pierre Foucault, a blind teacher of the Paris Institution for the Blind, on Jan. 19, 1849. The types in this machine were formed on the ends of a number of converging rods sliding in radial grooves to a common printing-point; the upper part of each rod contained a finger-key, and these finger-keys together formed a curved keyboard of two rows. Letter and line spacing devices were also included. When used for the blind the types were made to imprint their faces into the surface of the paper. The inventor also appears to have adopted the machine to ordinary printing by the use of carbonized paper.

Foucault's typewriter attracted great attention and was awarded a gold medal at the World's Fair in London, in 1851. Several of them were constructed and were for a long time used in the various institutions for the blind in different parts of Europe. They do not seem, however, to have come into very general use, or to have contributed anything to the development of the modern writing-machine.

Another typewriter, designed principally for the use of the blind, the invention of William Hughes, governor of the Manchester Blind Asylum, was also exhibited at the World's Fair in 1851, and received a gold medal. It is of very simple construction, much resembling some of the modern toy writing-machines in principle.

The Beach typewriter, the invention of A. Ely Beach, of New York, one of the editors of *The Scientific American*, marked a considerable advance in the development of a practical writing-machine. After constructing a machine in 1847 which contained some new features, and which worked fairly well, he was granted another patent (June 24, 1856) for a machine which consisted of a series of type-carrying levers arranged in the now familiar form of a circular basket, and all printing at a common center. It was mainly designed to print raised letters for the use of the blind, and was furnished with two sets of type-bars, one carrying depressed types striking the paper from below, while the other, carrying raised types, struck the paper from above, embossing on it the required character. Applied to ordinary typewriting, only one set of type-bars was employed. They struck upon a small table over which the ribbon of paper was conducted. The ink was furnished by an endless band of carbon paper or inked fabric. This machine did good work, but was slow in its operation. The method of printing was closely akin to that subsequently brought to a practical outcome by others, but it provided for the printing of characters only upon a narrow ribbon of paper, instead of on sheets.

Other Early Typewriters.—It is impossible to describe here in detail all the early attempts to perfect a writing-machine. Notable among them is the invention of O. T. Eddy, of Baltimore, Nov. 12, 1850, a cumbersome machine which used seventy-eight vertical type-bars with the types on their lower ends, and a flat horizontal platen whose lateral and longitudinal movements furnished line and letter spacing; the only one ever made, however, did neat work. The Fairbanks machine, also of 1850, had a number of converging rods with types on one end, printing at a common center, and finger-keys on the other; it was designed

for printing on cotton fabrics, but proved impracticable. The typewriter invented by J. M. Jones, of Clyde, N. Y., and patented in 1852, and again in 1856, had types placed underneath the rim of a horizontal wheel, which was rotated and depressed by a lever so as to print on the paper held beneath. Suitable mechanism for line and (variable) letter spacing was provided in connection with a cylinder for paper. Another type-wheel machine was patented by J. H. Cooper, of Philadelphia, in 1856. In 1854 the Thomas typograph was patented; this was a small, cheap typewriter, suggestive of the modern toy machines.

The Francis Typewriter.—The invention of S. W. Francis, a physician of Newport, R. I., was patented Oct. 27, 1857. The types were arranged upon a series of hammers placed in a circle and moved to a common printing-point upon a small circular platen, which was supported from the framework, and which it was necessary to remove in order to insert a fresh sheet of paper. The key action resembled that of a piano. The depression of a key caused the type to rise toward a common center and print upon the paper through an inking-ribbon so arranged that it presented a fresh portion of its surface at each depression of the keys. The paper was held flat in a rectangular frame, moved by a drum containing a coiled spring, to which it was attached by a cord. At the end of a line the frame was drawn back, thus rewinding the spring and at the same time moving the paper forward a line-space. The machine was provided with a bell to indicate the end of the line (a device also employed in Beach's first machine). The machine printed clearly and with a speed exceeding that of the pen, but it occupied a space of about 2 feet square. Only one machine was constructed under the patent, and no attempt was ever made to put it on the market.

The Hansen Machine.—The writing-ball invented by Rasmus Johan Malling Hansen, a clergyman of Copenhagen, Denmark, is perhaps the best-known European invention of the kind; it is said to have been made and sold in continental Europe in considerable numbers. In the U. S. it is known only as a curiosity, although U. S. patents were issued upon it in 1872 and later, and it was exhibited at the Centennial Exhibition in Philadelphia in 1876, receiving a gold medal. The main feature of the machine, from which it took its name, is a hemispherical brass shell inverted over the paper-carrying and spacing mechanism. Fifty-four rods or pistons protrude through this shell, radiating in different directions from the center of the sphere, which is the common printing-point; each carries a type on the lower end and a finger-key on the upper. Different modifications of the paper-carrying device have been applied. The first designs provided for the use of an electrical mechanism to move the carriage. The machine was furnished with a bell to indicate end of line, scale to show locality of impressions, etc. The spacing mechanism was operated by a slight depression of the ball or hemisphere which followed the depression of the key. The machine was well made, weighed only about 8 lb., but was costly and too slow in operation, though it did good work.

The Sholes and Glidden Typewriter.—The first practical writing-machine was the invention of three men, residents of Milwaukee, Wis., working in conjunction: C. Latham Sholes, a printer and editor; Samuel W. Soule, also a printer, as well as a farmer and inventor; and Carlos Glidden, a gentleman of leisure. The first crude model, completed in Sept., 1867, was largely the work of Soule, who suggested the pivoted types set in a circle, and other minor details; Sholes contributed the letter-spacing device. It was a success in that it wrote accurately and with fair rapidity. Many letters were written with it and sent to friends, among others to James Densmore, of Meadville, Pa., who had sufficient enthusiasm to purchase an interest in the machine without even seeing it, by the payment of all the expenses already incurred. About this time both Soule and Glidden dropped out, leaving the enterprise wholly in the hands of Sholes and Densmore. The first patent upon the new machine was granted to the three associated inventors in June, 1868. It describes a machine with a circle of type-bars striking upward to a common printing-point. The keys resembled those of a piano, and moved the type-bars by means of cams or arms on the inner ends of the key-levers. The paper was held horizontally in a square sliding frame or carriage moving across the top of the machine and provided with lateral and transverse motions for line and letter spacing. An arm extending from the rear of the main frame supported a small platen at the common center. An inked ribbon passed across this platen from spools situated on either side of it. The action of the type, therefore, served to carry the paper against the inked ribbon, so that the impression was upon the side of the paper opposite to the type. The motive-power for the carriage motion was provided by a falling weight unwinding a cord from a drum at the side of the machine. In July of the same year another patent was granted to Sholes, Soule, and Glidden for a machine substantially the same as the one just described, except that the connection between the key-levers and type-bars was made by means of connecting wires or rods. Urged on by Densmore, Sholes continued to make improvements, until in 1871 the machine had assumed a form differing in many particulars from the original model. A patent issued to Sholes in this year shows the use of a cylindrical platen which extended from front to rear and around which the paper was passed lengthwise. The letter-spacing was accomplished by a double ratchet on the axis of the cylinder, which was operated upon by a "twofold vibratory ratchet." This permitted the cylinder to turn the space of a letter only at a time. The shifting of the line was accomplished by a screw-cam upon the cylinder engaging the teeth of a rack placed beneath it upon the top of the frame. An extra wide notch in the ratchet-wheels marked the line on the cylinder where the edges of the paper overlapped one another. While the cylinder revolved past this point the screw-cam engaged the teeth of the rack and threw the cylinder, which turned loose upon its shaft, toward the rear of the machine a sufficient distance to make the line-spacing. The inking-ribbon passed across the type-basket in a direction parallel to the line of writing, as in the present Remington machine, but at right angles to the line of travel of the cylinder. Numerous models were turned out, but in the hands of practical users each proved to be in some respect defective, and broke down under the strain of constant usage. The machines which had been made so far were but crude products of the shop of an ordinary mechanic, and it was necessary to enlist the assistance of manufacturers able to make them on a large scale and supplied with sufficient capital to support the enterprise until there should be a market for them. Densmore made a contract with E. Remington & Sons, gun-manufacturers at Ilion, N. Y., and the improved machine has been called the Remington typewriter ever since.

The Remington Typewriter.—The ample resources and skillful workmen available at the great Remington factory were employed in the extensive improvement of the typewriter, and the first machines were ready for sale about the middle of 1874. The No. 1 Remington, the first typewriter to come into general use, was in general appearance not unlike a japanned box with a cover on the top, and with the keyboard projecting toward the operator at the bottom. The roller, around which the paper passed, ran from side to side, the key-levers were directly connected with the outer ends of the type-bars by means of connecting wires or rods, and the spacing was done by a crude rack and dog mechanism resembling in principle the device in later models. The carriage was returned by the action of a foot-treadle upon a pulley at the side of the machine—a form which was subsequently replaced by a side hand-lever, thus doing away with the necessity of a special table. The machine also contained one of the devices invented by Sholes at the time the machine was first brought to Ilion, in the form of a slotted disk forming a guide for each individual type-bar, a device which was long supposed to be essential to the preservation of alignment, but which later experience has shown to be a hindrance rather than a help.

The No. 1 Remington was exhibited at the Centennial Exhibition at Philadelphia in 1876, and attracted much attention, although it was slow to gain public favor. One great objection was that it wrote only capitals; but this was obviated by the joint efforts of two inventors, Lucien S. Crandall and Byron A. Brooks. Crandall devised and patented a method of carrying more than one type upon the type-bar. His original attempt was to simplify the machine and render it less complicated and expensive by reducing the number of parts. Six types were carried upon one type-bar. The swinging motion of the platen caused it to move to any one of three positions, each serving as a common center to a pair of the types. The oscillation of the keys served to determine which one of this pair should be brought to the printing-point. The device was ingenious, but it involved too much care in the manipulating of the machine to be deemed successful. Byron A. Brooks adapted Crandall's

idea to a type-bar carrying only two types, one a capital and the other its corresponding small letter. The change in the printing-center was accomplished by sliding the platen in a direction transverse to the line of writing by means of an extra key and corresponding mechanism. By properly adjusting the curve of the cylindrical platen to the distance between the types on the bar, and by sliding the platen a proper distance, it was possible to print either one of the two letters carried on the type-bar at will. Thus was devised a machine which could write both capitals and small letters without increasing the size of the key-board or adding to the number of the type-bars. The well-known Remington No. 2 typewriter embodies these inventions, and was placed on the market in 1878. One of the first machines of this model was exhibited at the Paris Exposition in that year, and was awarded a gold medal.

The sales increased materially, although still disappointingly slow, and the selling agency, after passing through several different hands, was finally undertaken, in 1882, by the firm of Wyckoff, Seamans & Benedict. Since then thousands of these typewriters have been sold, the machine has maintained a commanding position in the market, and in 1886 the firm assumed entire control also of its manufacture.

In 1886 the No. 3 Remington was put on the market, in response to a demand for a machine which would carry wider paper than the No. 2 (the latter writing a line only 6½ inches long). The position of the rack and spacing-dogs is reversed in this machine. Four new keys were also added to the keyboard, thus accommodating eight more characters than the No. 2. The No. 3 Remington writes a line 12 inches long, and can take paper 14 inches wide, and can be made to accommodate even a greater width by a few unimportant changes. In 1888, to meet the requirements of some European countries, the No. 5 Remington was introduced. This is intermediate between the No. 3 and No. 2, writing a line 7½ inches long, and taking paper as wide as 9½ inches. In general construction it resembles the No. 3. It has the same number of keys, the additional characters being utilized to provide for the accented letters, etc., required in many foreign languages. The No. 4 Remington is a single-case machine, closely resembling the No. 2 model in general appearance, but writing capitals only.

Improvements have been continually added to all of these models. In 1894 the No. 6 Remington was first offered for sale. In this new model important changes in the design of the paper carriage, spacing mechanism, and ribbon movement have been effected.

The Caligraph.—This is a machine which was devised under the direction of G. W. N. Yost, principally by a skilled German mechanic named Franz Wagner. His aim was to avoid a conflict with the Remington patents, but, failing in this, he secured a license under them to manufacture his proposed machine. The Caligraph was placed on the market in 1883. It does not employ a shift-key, using instead a separate type-bar for each letter, whether capital or lower-case. Hence it has a much larger keyboard, a greater number of longer type-bars, and consequently a much larger type-basket. The key-levers are of the third order (instead of the second, as in the case of the Remington), the fulcrums being in the front of the machine. The keys are ranged in six rows in an inclined plane, while the connecting wires by which they operate the type-bars are attached to the inner end, or end opposite the fulcrum. The arrangement of the keys is peculiar to the machine. The paper carriage has a platen cylinder with polygonal faces to adapt itself to the faces of the types. The motive-power of the carriage is furnished by a torsion-spring, which impels the carriage to move from right to left until the line is finished. The letter-spacing is effected by an oscillating dog or pawl which operates in a double sliding rack. The line-spacing is accomplished by a carriage-lever operated by hand, in a manner similar to the Remington mechanism for the same purpose. It is made in four styles: the No. 1, having forty-eight keys, printing only capital letters, punctuation-marks, and figures; the No. 2, which has seventy-two keys, and prints both upper and lower case letters; the No. 3, which differs from the No. 2 mainly in the addition of another row of keys, making the available characters seventy-eight; and the No. 4, which exhibits improvements in minor details of construction.

The Hammond typewriter, invented by James B. Hammond, is covered by patents taken out in 1880, 1881, 1882, and 1883. The applications for some of these were filed as early as 1875. The machine is of the type-wheel variety, and presents radical differences in theory and construction when compared with other writing-machine inventions, except the "pterotype," invented by John Pratt, of Centre, Ala., and fully described in a paper read by him before the London Society of Arts in 1867. In the latter, of which only a very few were ever made, the types were arranged all on one plate, which was moved so as to bring the desired letter to the printing-point, when the impression was made by a hammer-blow on the paper, this being carried along in a square frame furnished with devices for line and letter spacing. Hammond's invention, which appears to have been a conception entirely independent of Pratt's, very strongly resembles it in principle. Hammond was finally successful in his efforts to control the motion of the type-wheel, a problem which Pratt failed to solve. The two inventors were placed in interference in the U. S. Patent-office, with additional complications arising from the presence of a third application upon a type-wheel machine by Lucien S. Crandall, whose device is described later on. By concessions on the part of Pratt, Hammond was enabled to proceed with his applications. The "Ideal" Hammond, first put on the market in 1884, has an almost semicircular keyboard, consisting of two banks of ebony keys. Each key controls the printing of three characters. The key-levers radiate from the center of a small turret-like casing, which contains the printing apparatus in the shape of a type-wheel, a small hard-rubber wheel made in two sectors of a circle, each containing forty-five characters disposed in three rows upon its outside periphery. This wheel turns freely in a horizontal direction. The depression of any key serves to throw forward the type-wheel a greater or less distance, bringing the proper type to the printing-point. The exact position of the type is determined by a small stop-arm oscillating on the shaft of the type-wheel, and engaging one of a series of thirty hardened steel index-pins, one for each key-lever. The lower end of each of these pins stands directly above its corresponding key-lever, and when a key is depressed the corresponding index-pin rises immediately, throwing its upper end into the path of the stop-arm, thus checking it, and consequently the type-wheel, at the exact point required. The type-wheel can readily be removed and another substituted for it. The paper-carriage runs directly behind the type-wheel turret. A pair of rubber-covered rollers hold the paper in a vertical position against the face of the type-wheel. An impression-hammer strikes from behind, carrying the paper forward upon the face of the type with sufficient force to cause an impression to be made. The spacing mechanism consists of an ingenious though very complicated set of leverages, which also impel the hammer. An escapement wheel with pawls regulates the step-by-step motion of the letter-spacing. The inking is done by a narrow ribbon. When capitals or figures are required the use of the proper shift-key elevates the type-wheel, bringing another line of type into the printing line. The arrangement of the original (now termed the "Ideal") keyboard of the Hammond machine differs materially from that adopted by the Remington, to which almost all new machines conform. This led to the manufacture of a new model of the Hammond, which appeared in 1890, termed by the makers the "Universal Hammond." This machine differs from the first model only in adopting three banks of keys ranged according to the Remington Standard, with the space-key in the same position as in that machine. Still later, a light rubber shell containing the type-faces was substituted for the type-wheel. This was supported by a metal backing, giving rise to the name "anvil and shuttle" machine.

The Hall Typewriters.—Thomas Hall, of New York, secured a patent in 1867 on a machine upon which he had long been at work. Only a few of these typewriters were constructed; one, printing seventy-two characters in large and small letters, etc., was sent to the Paris Exposition of 1867, and another attracted great attention in the Government departments at Washington. The type-bars struck downward to a common center upon the surface of a flat platen, which slid into the bottom of the machine and worked from side to side to provide for spacing the letters, this being accomplished by an ingenious device which varied the space according to the width of the letter printed. Each type had a separate type-bar, which was also furnished with a peculiarly adjusted counterweight intended to facilitate the impression and return of the type. The type-bars fell upon a cushioned ring near the printing-point, a device

by which a degree of uniformity of impression was accomplished. The inventor claimed to be the first to produce a portable, keyed, type-bar typewriter, and that the Francis machine was the only one of the type-bar variety which printed before his; in some respects, however, his device resembles the Foucault machine of 1833, described above.

In 1881 Hall took out a patent for a typewriter upon a totally different plan. The peculiar feature of this machine is that in it the paper is at rest, while the printing apparatus moves about over it as it brings the required type to the printing-point. The paper is placed around a small rubber-covered roller, which is turned by a suitable ratchet and pawl at the left of the machine to accomplish line-spacing, and after leaving the feed-roll it passes over a flat metal bar wide enough to serve as a printing-platen. The printing-carriage is composed of two metal plates, one about three-eighths of an inch above the other, and is so adjusted that it may slide or turn upon a rack-rod which supports its rear edge. Attached to the top of the carriage, and engaging with this rack-rod, is a pinion containing a spring which drives the carriage. At the right of the carriage, and working into the grooves or notches of the rack-rod, are the feeding-dogs, which after each impression permit the carriage to move forward a letter-space. A flexible vulcanized-rubber type-plate is mounted upon a small frame just beneath the upper plate of the carriage. This frame is connected with the under surface of the upper plate by two pairs of parallel levers which permit its horizontal movement in a longitudinal or transverse direction, thus permitting any type upon the type-plate to be brought to a hole in the lower plate, large enough to permit of the printing of one type. The upper surface of the under plate is covered by a pad saturated with aniline ink, by which the types are inked. At the front edge of the frame upon which the type-plate is mounted, an arm extends beyond the edge of the plate and to this is rigidly attached an index-key which carries a peculiarly shaped pointer at its free end. Under this pointer is a vulcanite frame pierced with as many round holes as there are separate characters upon the type-plate, each hole disclosing its corresponding character printed upon a white surface beneath. The index-key pointer is placed in the hole which shows the type required. The motion requisite to do this also moves the type-plate so as to bring the corresponding type to the printing-center over the aperture in the lower plate. Pressure upon the key then depresses the whole of the printing-carriage upon its bearings, causing it to descend until the face of the type, by means of a small stud projecting downward through the upper plate just above the opening in the lower plate, is pressed upon the surface of the paper, leaving its imprint there. This ingenious machine does good work and has been much used, but lacks among other things the essential quality of speed.

Mr. Hall also invented the Century typewriter, a similar machine, except that the paper moves instead of the printing mechanism. There are 100 characters, ranged in ten rows of ten each, on a rubber or metal type-cylinder.

The Crandall typewriter is the invention of Lucien S. Crandall, and is covered by U. S. patents of 1881, 1886, 1888, and 1889. It is a rather compact machine, made entirely of metal, and has a slightly curved key-board of twenty-eight keys arranged in two banks. From this, by the aid of two shift-keys, eighty-four characters are controlled. The types are all arranged on a removable circular metal sleeve with fourteen faces, which revolves and slides upon a nearly vertical shaft. The paper is carried upon a cylindrical platen, and travels across the rear of the machine just behind the type-sleeve. The key-levers converge toward a common center in the rear of the machine, and control rotary and vertical movements of the type-sleeve. When the proper type has come into place for printing, the shaft of the type-sleeve is moved forward, bringing the type-face into contact with the inking-ribbon, forcing it against the paper and making the required imprint. The inking-ribbon, which is only five-eighths of an inch wide, falls back after each impression, leaving the line of writing in sight. The first model was provided with a variable spacing device, but this was abandoned when the machine was substantially remodeled in 1887, thus illustrating the fact that variable spacing is neither desirable nor practicable.

Mr. Crandall is also the inventor of the International typewriter, which has seventy-six type-bars, but only thirty-eight keys, each of the latter operating one or the other of two type-levers (and hence of two type-bars and types) according to the position of a shift-key.

The Columbia typewriter is the invention of Charles Spiro, of New York, and was first exhibited at the American Institute fair in New York in 1884. Mounted upon a metal base is a small carriage sliding in grooves cut lengthwise and carrying a revolving paper-cylinder governed by ratchet and pawl mechanism to provide letter-spacing. Just above the upper surface of the paper-cylinder is a vertical wheel with printers' type set in its periphery, and with a convenient handle by which it is turned. The type-wheel contains a bevel gear upon its left-hand side which engages in a similar gear upon the edge of a circular horizontal disk, the upper surface of which is marked with the letters and characters carried upon the type-wheel. An index is fastened to the center of the disk, and indicates the character upon the type-wheel which will be printed when the type-wheel is depressed. Inking is done from a pad located at the lower edge of the type-wheel. A double-case machine with two type-wheels shifting horizontally upon the line of the shaft was also made. The machine was also fitted to write music by substituting the characters of the musical notation upon the wheel. For a time there was a considerable demand for machines of this make.

The Yost Typewriter.—When G. W. N. Yost retired from the Caligraph enterprise he, in conjunction with others, devised the typewriter now known by his name and covered by a number of patents, chiefly those of 1885, 1888 (about which year the machine was first sold), and 1889. The type-bars (each carrying only one type) are compound levers, using what is known as the "grasshopper" movement, invented by a mechanic named Davidson. They are assembled around the inside of a circular frame, as in other machines, and move by an irregular path from the surface of an inking-pad placed in the upper portion of the type-basket toward a common center, when they enter a small metal guide intended to insure the exact alignment of type at the point of impression. The complex movement of the type-bar is secured by a link pivoted to the type-bar and also to a central post or table. Such a device requires the joints of the type-bar action to be loose instead of close-fitting, but it is claimed that the bad alignment which would naturally result therefrom is corrected by the central metal guide referred to, the invention of C. L. Driesslein. A similar principle was also employed in a typewriter invented by G. House, of Buffalo, N. Y., in 1865. The carriage of the Yost machine is of the ordinary pattern, but very light and narrow. As the connecting wires operate the type-bars they also operate upon a circular ring or universal bar which is placed in the lower part of the type-basket and is supported at its center. This in turn acts as a lever to move the dogs which vibrate from side to side of a double-toothed horizontal rack attached to the carriage, thus providing the letter-spacing.

The Smith-Premier Typewriter.—The parts of this machine which are of recent invention must be credited mainly to Alex. T. Brown, although it bears the name of L. C. Smith, its manufacturer. It is a type-bar machine, printing seventy-six characters by the single-type system. It was first put upon the market in 1889, but that model was withdrawn shortly afterward and replaced by another in 1890. The keyboard is rectangular and consists of seven rows of keys. The connection between the keys and the type-bars is made by a series of rocking-shafts journaled into the frame of the machine at front and back. Each of these rocking-shafts carries two short crank-arms—one at the front, by which it is attached to the vertical stem of the finger-key, and the other nearer to the center of the machine, by which the connecting-rod is operated. This device was invented by C. Latham Sholes in 1881, and his application for a patent was allowed, but he never took out the patent because of the objectionable character of the numerous frictional bearings which the mechanism involved, and the idea became public property. The type-bar of the Smith-Premier is of a peculiar crooked form, and delivers a somewhat indirect blow. The bearing, or hanger, upon which it is mounted is about 1½ inches long, the great length being designed to secure better alignment, and the series of hangers is disposed diagonally upon the edge of the type-basket. This method of attaching the type-bars is found in the British patent to Bain and Wright, in 1841. The carriage consists of a cast-iron frame, which slides upon ball-bearings set in grooves. The carriage-frame does not lift, but the platen, which is also removable, is adapted to slide forward and bring the line of writing into view just above the scale which is fixed to the front portion of the

carriage. The letter-spacing is accomplished by means of a sliding plate, 9½ inches long by 2½ inches in width, fitted into the back of the frame at the base, and operating a bell-crank connected with the usual spacing-dogs and horizontal rack. Each of the finger-key rocker-shafts passes through a hole in this plate eccentric to its own axis, and when the key is pressed causes the plate to slide by means of a small stud or cam. The carriage is returned by a lever, as in other machines, but the line-spacing is done by automatic mechanism operated by the pressure of the carriage lever at the end of its return movement. The inking is done by a ribbon lying parallel with the cylinder. This moves transversely across the type-basket from front to rear of the machine as the keys are operated, and reverses automatically when the types strike near the edge of the ribbon. On the return a longitudinal motion is also imparted to the ribbon, so that the impressions are made in a new place. This machine also contains a novel feature in the shape of a circular brush mounted horizontally upon a vertical shaft, and resting just below the types when they are at rest. By means of a screw-motion, operated by a removable crank-handle, this brush is revolved over the faces of the types so as to clean them. A new model, called the No. 2, containing improved spacing mechanism and other details, was placed upon the market in 1895.

The Bar-lock typewriter is a type-bar machine of the downward-stroke order, invented by Charles Spiro, of New York. The keyboard has seventy-two keys of the ordinary pattern, arranged in six rows of twelve each, besides a space-key. The type-bars, each of which carries a single type, stand erect in a crescent-shaped double row behind an ornamental screen of ironwork erected between the keyboard and platen-roll, and strike down and away from the operator to the platen when the keys are depressed. The paper-cylinder, or platen-roll, is borne in a carriage of the usual form which travels across the rear of the machine. The impression is made through a narrow inked ribbon, which is automatically moved in and out of the line of writing. The carriage is moved step by step by the action of a universal bar underlying the key-levers in much the same manner as in the Remington. The typewriter takes its name from a peculiar arrangement intended to secure perfect alignment, and consisting of a semicircular frame bearing a row of short, pointed, phosphor-bronze pins, set perpendicularly so that every type-bar when it descends to the printing-point must pass between two of them. It is claimed that this device, in connection with the ball-and-socket joint which is used for the type-bar, so locks it into position that any serious derangement of the alignment is impossible. Another advantage claimed for the Bar-lock is the visibility of the work, notwithstanding the structures between the operator and the line of writing. This machine was at first sold only abroad, but it was placed on the American market in 1891. The machine is made in several sizes in order to accommodate different widths of paper, but the essential features are the same in all.

The National typewriter, manufactured in part under a patent issued to H. H. Unz in 1889, and in part under letters patent of 1885, was first placed upon the market about the year first named. It is an upward-stroke, type-bar machine, with the usual paper-carriage and a curved keyboard containing twenty-nine keys, including two shift-keys. Each type-bar carries three types. In the normal position the depression of a key carries the middle type to the printing-point. By depressing a shift-key the entire keyboard, together with the connecting-rods, type-bars, hangers, and types, is shifted forward or back to bring one of the other types to the printing-point. The lifting portion of the carriage-frame is fitted with a gravity pointer to indicate the printing-point. This machine is a good manifolder, as the great length of its type-bars adds to the force of the blow, although it renders the touch of the keys somewhat heavier.

The Franklin typewriter, invented by Wellington P. Kidder, has a nearly semicircular keyboard, the keys being arranged in three rows around the front side of an upright shield, behind which stand the type-bars, which strike downward upon a common printing-point on the upper side of a cylinder of the usual pattern. The carriage is propelled by a spring encircling the shaft of a cog-wheel, which engages with a rack attached to the under side of the carriage. Each type-bar carries two types, and the platen is shifted to bring the printing-point from one to the other. Slotted guides are used to secure steadiness in the downward movement of the type-bars. Ink is furnished from a narrow ribbon which automatically unwinds from one spool, passes over the printing-point, and is rewound upon another revolving on the same shaft. The machine weighs about 12 lb., and has had a limited sale.

The Densmore Typewriter.—The original devices of this machine are the inventions (chiefly) of Walter J. Barron, Amos Densmore (a brother of James Densmore), and Charles E. and M. G. Merritt. The machine has thirty-eight keys, placed according to the standard Remington arrangement. These, with the aid of a single shift-key, permit the writing of seventy-eight characters, as the type-bars, which are arranged in a basket as usual, carry each two types, and a few characters are formed by combinations of two types. The key-levers are of thin metal, giving the machine a more inelastic touch than the machines employing wood for this purpose. The connecting-rods are not directly attached to the type-bars, but to the ends of shorter subsidiary levers placed directly beneath them. A square eye is turned up at the end of each of these shorter bars and through this the type-bar proper passes, so that the type is raised to the common center whenever the key is depressed. The method of securing the hangers of the type-bars is peculiar to this machine. Each hanger has a small projection or shoulder which fits into a square hole mortised into the top plate of the machine near the edge of the type-opening. Each hanger, with its type-arm, is made with reference to the type it is to control, and numbered to show its particular position on the top plate. By this method the type-bars are readily placed in the machine; it is also claimed that permanent alignment is insured. The paper-carriage is hinged upon the back way-rod, and, as in the Remington, can be raised. The platen can also be raised in the carriage frame, and is also removable from the carriage. The inking-ribbon shifts from front to rear of the machine so as to bring every part of its width over the printing-center; a slow, continuous longitudinal motion is at the same time imparted to it by the action of two frames upon which the spools are mounted, and when the carriage is returned to begin a new line the ribbon is shifted lengthwise by about the width of one type, so that the next line of impressions will fall upon a fresh portion. When the ribbon is all wound upon one spool, the gear is automatically shifted to return it to the other by the same process. The machine was first sold in 1891.

The Williams typewriter is in part the invention of J. N. Williams, of Brooklyn, N. Y. Its keyboard contains only twenty-eight keys, but each type-bar carries three types, the printing-point being governed by shifting the platen. The alphabetical characters are arranged as in the Remington keyboard. The type-bars rest in a horizontal position upon the top of the frame and are arranged in two sections of fourteen each, between which the paper-carriage, carrying a cylindrical platen, moves from right to left. The impression is made upon the top of the cylinder, so that the line of writing is in sight of the operator. The depression of a key raises the type from the position in which it normally rests (in contact with an inked pad) and brings the face of the type down upon the surface of the paper. A central forked guide is provided at the printing-point, intended to prevent bad alignment. The machine is also fitted with a toothed rack in front of each section of type-bars to receive and hold each type-bar steady in printing position. The machine was placed upon the market in the latter part of 1891, and has been advertised and sold to some extent.

Other Typewriters.—Besides the machines described at length in this article, and those alluded to sufficiently in connection with others, there are a considerable number worthy of mention. The Dennis-Duplex typewriter was patented in 1890 by A. S. Dennis, of Des Moines, Ia.; it resembles the Remington or Caligraph in general, but contains 100 types and type-bars, with the keyboard divided into two sections, each containing all the lower-case letters, while the capitals and punctuation-marks are divided between them. The types corresponding to the two sections print at different centers one letter-space apart, and the machine is arranged to print two letters simultaneously. The Brooks typewriter has vertical type-bars arranged in a semicircle, and striking downward upon a platen placed between them and the keyboard. Each type-bar carries three types, with the middle one (lower case) printing normally, and the shift-keys move the platen so as to print the outside ones. The writing is in full sight of the operator. The Fitch machine embodied inventions of Eugene Fitch, of Des Moines, Ia., and W. H. Slocum, of Buffalo, N. Y. The type-bars, each

carrying three types; struck down, past an inking-wheel, upon a cylinder in the middle of the machine, and the writing was in sight. The Automatic typewriter was invented by E. M. Hamilton; it was of the type-bar variety, but was very compact, being only 11½ by 8 by 4 inches. The letter-spacing was variable, and the work resembled ordinary printed matter. The Daugherty typewriter is a type-bar machine with two types to the bar, but the shift is made by raising the type-bars instead of moving the paper. The key-levers are directly attached to the ends of the type-bars without the intervention of any connecting mechanism. The type-bars are arranged in an arc, and lie down flat over the key-levers, but when operated strike upward to a common center located by a vibratory guide. The line of writing is visible to the operator. The Munson typewriter is similar to the Hammond in principle, but differs in the method of controlling the movements of the type-sleeve. The Blickensderfer machine also belongs to the type-wheel class, but is more similar to the Crandall. The arrangement of the keyboard differs materially from the Remington, and is said to resemble that of a printer's case. The spacing after a word is performed automatically with the imprinting of its last letter. The Rapid typewriter, invented by Bernard Granville, of Chicago, in 1887, had straight, square, horizontal type-bars arranged radially with reference to the printing-point. The types were cut on the ends of the bars, at the proper angle so as to strike the paper squarely. The machine was operated by keys, and perfect alignment was to be secured through the close-fitting square holes through which each type-bar was carried. The device was a failure. The Boston typewriter was the invention of D. E. Kempter, of Boston, Mass. (patented in 1886); it resembled in principle the Columbia typewriter described above.

The "English" was an English machine somewhat resembling the Bar-lock. The Lasar was another down-stroke machine, originating in St. Louis, Mo. The Typograph was a machine with type-bars striking downward upon a flat platen from a semicircular type-basket. None of those are now in the market. The Maskelyne, Mercury, and Gardner typewriters are of English origin, unknown in the U. S. The last-named seeks to reduce the number of keys by writing one character by the use of two keys at one time, an arrangement which is unlikely to commend itself to practical users of writing-machines. The Westphalia and Hammonia are German machines, the latter being better and cheaper than the former. They are of the single-key order, the types being held in a sliding holder, and are slow; but they can print ten or twelve copies at once. Carbon paper is used in place of a ribbon or pad.

Toy Machines.—The popularity of the typewriter as it came into more general use caused a demand for cheaper machines. Inventors soon produced devices to meet such demand, and a large number of machines came upon the market, some of which, though incapable of great speed, did very good work. These are generally known as "toy" machines, and can hardly be considered competitors of the larger typewriters.

The Sun typewriter, one of the pioneers in this line, is the invention of L. S. Burridge and Newman R. Marshman. It was put upon the market in 1884, and met with a limited sale. Attached to a single key, or handle, is the type-holder, a straight bar with type cut upon its lower surface, sliding in guides above and at right angles to the paper-carriage, which is of the usual description, with mechanism for letter and line spacing. In close proximity to the type-holder is a fixed comb, or rack, bearing upon its upper surface an index of the characters contained in the type-holder, one to each notch in the rack. By bringing the key to the notch opposite the desired character, the proper type is brought into printing position. The type-holder is then pressed downward upon the surface of the paper. Inking is accomplished by small rollers, one on each side of the center of the type-holder, so that whichever way it moves the types are sufficiently inked. The Odell typewriter, first placed on sale in 1886, is similar in general design to the Sun, and seems to be a slight improvement. The type-holder is made with two faces instead of one, either being rocked into printing position at will, and hence the machine writes both capitals and small letters.

The People's typewriter, or Prouty typograph, was another very simple device, consisting of a carriage containing a sort of metal bow bearing characters electrotyped from ordinary printers' type, and hinged over a small rod bearing the paper. It was of no practical value and soon disappeared. Its inventor, E. Prouty, of Chicago, also devised a typewriter containing a series of type-bars in a semicircular form placed horizontally and striking upward to a common center on a carriage of the usual type running across the rear of the machine. The machine now known as the People's typewriter, also the work of E. Prouty, was put on the market from Chicago about 1890, and has been sold to a limited extent. A horizontal type-wheel bearing two rows of characters upon its periphery revolves in front of the carriage—a small roller adapted to grasp the paper, and mounted upon a vibratory frame. The type-wheel is moved by a handle extending toward the front of the machine, and resting immediately above a semicircular index-plate by which the position of the type upon the wheel is indicated. The operation of the printing-key, at the left of the machine, serves to bring the platen smartly forward against the surface of the type-wheel, at the same time engaging a tooth or spur in a notch in a ratchet-wheel carried upon the type-wheel shaft, thus securing correct position of the type. Inking is performed by means of a ribbon which partially encircles the face of the type-wheel.

The World typewriter, another machine of this class, was invented by John Becker, of Boston (U. S. patent, 1886), and was first placed on the market in 1886. As a novelty it attracted much attention, and many of them were sold. A flat semicircular disk, carrying on its under side a segment of rubber with the type faces cast upon it, revolves horizontally upon top of a short post or stud. Toward the front of the machine extends a combined pointer and handle which operates the type-disk and also passes over a semicircular index containing all the characters to be found on the top plate. Upon pressing a key at the left of the type-disk the face of the type is pressed upon the surface of the paper, and at the same time the carriage is moved along one space automatically. The inking is done by a pad which lies beneath the disk, with an opening at the printing-point.

The Herrington typewriter was a toy patented in 1884 and put upon the market in 1886 by Millison & Herrington, of Wichita, Kansas. It consisted of a pair of ways upon which a type-wheel, bearing the characters arranged alphabetically upon a vulcanized rubber strip, moved over the paper, which was placed flat beneath. The wheel was operated by twirling a knob at the right-hand end of the axis, and ink was supplied by a small felt roller playing over the top of the wheel. A card index on the inner side of the wheel indicated the position of the letters.

The Merritt typewriter, the invention of C. E. and Mortimer G. Merritt, consists of a paper-carriage hinged at the rear of the machine, a type-holder (carrying loose metal type which are interchangeable) sliding to and fro in suitable ways, and an index-plate. By placing the index-handle over the desired type on the index-plate and depressing it, a pin is operated to bring the corresponding type up through a guide until it prints upon the paper, and a universal bar is depressed and moves the carriage forward automatically to the place for the next impression. A separate space-key, operated by the left hand, provides for spacing between words, and the platen is turned by a milled knob at its right to make line-spacing.

The Victor typewriter is the invention of C. E. Tilton, of Worcester, Mass., and Arthur I. Jacobs, of Hartford, Conn., and is covered by patents of 1889. It consists of a paper-carriage of the usual description moved by a rack and pawl mechanism, a vertical wheel bearing upon its rear face a thin metal disk containing the types, which are made of vulcanized rubber, a striker or hammer moved by a separate lever from the left of the machine, and an index handle or plate by which the position of the type-disk is directed. The impression is caused by throwing the hammer smartly forward through a toothed rack cut upon the edge of the wheel until it pushes the type forward and impresses it on the paper. To facilitate this, the edge of the disk is cut between the types so that each one stands by itself on a flexible lip, which serves also as a spring to retract the type enough to clear the paper. Two small pads, situated one on each side of the printing-point, furnish ink to the types as they pass over them. By means of a small projection on the printing-lever, it is made to engage the spacing-lever and move the carriage at the same time that an impression is made.

The name "Crown" has been applied to more than one typewriter. The first was patented in May and June, 1887, by A. G. Donelly, and in some degree resembled the Hansen

writing-ball. A circular casing, much like an inverted bowl with perpendicular sides, was supported in an inclined position above a traveling paper-carriage of the usual design. Within it a series of type-bars were jointed in a circle, and adapted to strike downward upon a common center. The finger-keys were formed upon the upper ends of light rods, which were jointed to a collar upon the type-bars and projected upward in a circle through the casing. Each type-bar carried three type-faces, one upon each of three of the sides of a cube, so that a revolution of one-third upon its longitudinal axis in either direction brought another character downward into the printing position. This machine proved impracticable and was abandoned. The same name was adopted by Byron A. Brooks for a small machine which was on the market for a few years after 1888. This is solidly constructed for real service, although slow in operation. The printing is done by a metal type-wheel bearing characters in three rows upon its periphery, and carried upon a shaft inclined over the carriage, which is of the usual type. The front end of the type-wheel shaft also bears a gear-wheel meshing with the teeth of a straight rack which slides in ways across the front of the machine. The upper side of this rack carries a pointer, which passes over the surface of a celluloid index-plate bearing the characters found on the type-wheel. By sliding the pointer along the index-plate until it rests over any character, the type-wheel is rotated until the corresponding type is brought into the printing position. The impression is then made by depressing the type-wheel. A couple of shift-keys serve to move the type-wheel shaft in the direction of its axis so that a different row of type on the periphery of the wheel may be brought into position at will.

There are several other small machines upon the market under different names, but all working upon the same principles and having little practical value. Among such may be mentioned the Morris, McLaughlin, Simplex, Pearl, American, and Ingersolls.

Manifolding.—Copying-ink is generally used in typewriter ribbons and pads, so that reprints may be made by the use of the ordinary copying-press. By the use of carbon paper, interleaved with sheets of thin typewriter paper, several copies may be made on the typewriter at once.

As the the general use of the writing-machine increased, various attempts to widen its field of usefulness have been made by trying to adapt it to the work of writing in books. Several devices for this purpose have been invented, but none sufficiently practical to commend itself has yet appeared upon the market. A good deal of ingenuity has been expended in applying the principles of the successful machines to the solution of this problem, but as yet without success. W. O. Wyckoff and R. McKean Jones.

Typha: a genus of plants to which the Cat-tail (*q. v.*) belongs.

Typhlop'idæ [Mod. Lat., named from *Ty'phlops*, the typical genus, from Gr. τυφλώψ, blind; τυφλός, blind + ὤψ, eye]: a family of serpents, characterized especially by the development of teeth in the upper jaw (and not in the lower), and therefore called *épanodontiens* by Duméril and Bibron. They are worm-like animals, the scales are smooth and imbricated, and nearly alike all round; the head is short; above, it is covered by large scale-like plates; the eyes are minute; the nostrils between the post-rostral and labial plates; there is no apparent neck; the mouth is small and crescentiform; the anus is a transverse fissure near the posterior extremity. The skull has no ectopterygoid bones and no prefrontals; the rudiments of a pelvis are present, but no pubis. The family is represented by about half a dozen genera in various tropical countries.

Revised by F. A. Lucas.

Typhoid Fever, called also **Typhus Abdomina'lis** and **Enteric Fever** [*typhoid* is from Gr. τυφώδης (contracted from *τυφοειδής), smoky, stupid (of persons in fever), typhoid, deriv. of τῦφος, smoke, stupor; *enteric* is from Gr. ἐντερικός, in the intestines, deriv. of ἔντερον, intestine]: an acute infectious fever which has a duration of about four weeks, and is characterized by continuous high fever, abdominal distension, diarrhœa, a rash on the skin, and great depression.

Causes.—Typhoid fever occurs in all parts of the world and affects all kinds of people. It generally attacks young persons, from fifteen to thirty years of age, but exceptionally is met with in infants or old persons. Spring and autumn are the seasons of its greatest prevalence. In most large communities it is endemic—that is, isolated cases are constantly present—but under certain conditions local or widespread epidemics are met with.

The investigation of the specific course of typhoid fever was until recent years extremely difficult from the fact that clinicians had not learned to distinguish typhus fever from it. The credit of clearly establishing the points of distinction rests with William Gerhard, who prosecuted his studies in the Philadelphia Hospital. Since Gerhard's time it has become recognized that typhoid, unlike typhus fever, is not contagious—that is, it is not communicated directly from person to person in the ordinary intercourse. The infection in most, if not all, cases enters the alimentary tract with drinking-water, milk, or other food, directly or remotely contaminated by the intestinal discharges of persons ill with the disease. Exceptionally the virus may be directly conveyed to the mouth by unclean hands, or it may become dried and reach the nose or mouth through the air, eventually finding its way into the intestines. These facts are absolutely established by evidence of the most reliable character. The immediate cause is doubtless the bacillus described by Eberth, though there is much to be settled regarding the complete life history of this micro-organism. Certainly it does exist in enormous numbers in the intestines of persons suffering from typhoid fever, and in this disease alone.

The morbid changes in the body in typhoid fever are principally found in the lower part of the small intestines, where the Peyer's glands undergo swelling, necrosis, and, finally, deep ulceration. The spleen and the lymphatic glands of the abdominal cavity become enlarged, and the other organs of the body may suffer changes in consequence of continued fever.

The disease begins very gradually. At first the patient suffers with headache, backache, and unaccountable lassitude; frequently the nose bleeds, and sometimes colic and a little looseness of the bowels exists, though as a rule there is constipation. Gradually, day by day, the temperature rises, reaching a height of 103° or 104° F. in five or seven days. After this the fever remains elevated to about the same point, falling in the morning and rising again toward evening. The characteristic symptoms of the disease are noted in the second week of the disease and after that time. These are the regular fever, the great lassitude, the development of abdominal distention with tenderness over the seat of the ulcers in the ileum—that is, in the right side of the abdomen—and diarrhœa. In many cases, especially when the fever is decided, muttering or delirium, twitching of the muscles, and great prostration supervene. Stupor, and even complete coma, may occur. After about two weeks these symptoms gradually abate, the fever slowly descends, and a slow convalescence is established. About the seventh to the ninth day a rash is noted in the skin of the abdomen, consisting of small red spots, which appear in separate crops, and last but a few days, when they fade from view.

Many variations from this, which is the ordinary clinical course of the disease, are encountered. Sometimes there is scarcely any fever, or other signs of illness, and the case is spoken of as *walking typhoid*; again, the symptoms may be so intense that the case assumes a veritable *malignant* character. Fortunately, the latter are very rare. Minor variations in the symptoms, such as absence of the rash or of the diarrhœa, are quite common.

Death may occur from perforation of the intestines or hæmorrhage from deep ulceration; from slow exhaustion; or from various complications, as pneumonia, peritonitis, or the like. The mortality in typhoid fever varies greatly in different epidemics and at different periods of the same epidemic. Modern methods of treatment have lowered the death-rate very materially.

Treatment.—First and foremost in importance is proper nursing. Without this any treatment is seriously embarrassed. The patient must be confined to bed from the very first possible moment, in mild or severe cases alike; he must make no unnecessary physical exertion of any kind; and he must be given a diet which will be least irritating to the intestinal ulcers. Universal opinion has decided that diet to be milk, of which a quart to two quarts, diluted or undiluted, according to the digestive power, should be given an adult patient in the twenty-four hours. Sometimes eggs beaten in milk, broths, and similar food are better borne than milk.

The direct treatment of the disease is mainly concerned with the control of the fever. Remedies have been vaunted as specifics to cut short the disease, or to hold it in control, but these claims have not been accepted by the medical

profession. It is very probable that no remedy has power to alter materially the course of this disease. The control of fever by cold water, however, is of most decided value in preventing the serious results of continued high temperature; and has certainly the most marked influence in ameliorating the intensity of all the symptoms. In this way it has in practice reduced the mortality from 15 or 20 per cent. to 1 or 6 per cent. Properly carried out, this treatment consists in the immersion of the patient in a bath of about 70° F. every few hours, if the temperature reaches a high point. The patient at first is apt to shiver and to complain, but after a few baths grows accustomed to their use. Unfortunately, in private practice it is difficult to find the facilities, and the friends are led by mistaken sympathy to object to what appears cruel treatment. The results of hospital treatment, as well as of the private practice of those who have persisted sufficiently to overcome the objections of friends, leave not the slightest doubt as to the value of this method. Cold sponging, the application of cold cloths and the like, are also useful, though less so than tub-bathing. Febrifuges are all to be avoided as far as possible on account of their depressive action. Remedies may be needed to control diarrhœa, to aid digestion, to relieve nervous excitement, and to combat untoward symptoms of other kinds. During convalescence the utmost care should be exercised to prevent intestinal irritation by a too early return to the use of solid food. Tonics may be needed. Frequently the patient's health is much better after than before an attack, but this is not always the case. Not rarely relapses occur immediately after the attack; but once the patient has completely recovered there is nearly always immunity from subsequent seizures. Now and then, however, instances are met with of second or even third attacks. See also the article FILTH DISEASES.

WILLIAM PEPPER.

Typhon: See SET TYPHON.

Typhoon, tī-foon': a tropical cyclone, especially that of the China Sea. The storms first come in view in the southern part of this sea, and take a northeastern course, destroying shipping on whatever part is traversed by them and doing great damage on shore in the Philippine islands, Formosa, and even so far N. as Japan, and they are sometimes encountered far out on the Pacific Ocean on the latitudes of the latter country. They occur in late summer and in autumn and, except in minor details due to local geography, they are like the hurricanes of the West Indies and North Atlantic. The name typhoon is also frequently applied to similar great, intense storms of tropical origin in the southern hemisphere—about Samoa and the Fiji islands, and in the Indian Ocean about the Mascarenes. See HURRICANES. The center of a typhoon, round which the wind blows in circles, is usually a calm which varies in diameter from one-tenth to one-fifth of the storm-area. In the northern hemisphere the bearing of this center is always 8 points or 90 degrees to the right of the direction of the wind; for example, when the wind is N. the center bears E. In the right-hand half of the storm-disk the wind always changes to the right of the point from which it blows, while in the left half it changes to the left. When caught in such a storm the first change of wind will indicate to the careful seaman whether he is in the right half or the left half. If in the former it has been found that his safety lies in heaving-to on the starboard tack, and heading off from the center, but if in the left-hand half he will heave-to on the port tack and head toward the center. This is true of the northern hemisphere. In the southern hemisphere the direction in which the vessel will head when lying-to will be the reverse of this. Among the Chinese names for typhoon is *Kiu-fŭng*, which is defined by one authority as a "four-quarter wind," and by another as a "wind which blows from four sides at once."

MARK W. HARRINGTON.

Typhus Fever [*typhus* is Mod. Lat., from Gr. τῦφος, smoke, cloud, stupor arising from fever]: an intensely contagious disease, which is characterized by high fever, lasting ten days to two weeks, by a specific rash, and by great prostration. It occurs where squalor, destitution, and overcrowding abound, and has therefore been variously designated as ship-fever, jail-fever, camp-fever, and the like. In former centuries it was a common scourge, but is now almost limited to half-civilized countries and to the slums of great seaports. Local outbreaks are met with from time to time on ships, in jails, or other places of like character. The specific cause of the disease has not been discovered, though there is but little doubt that it is a micro-organism. The onset of the disease is very abrupt. After a brief period of preliminary indisposition, or without such, the patient falls into a chill or convulsion, or is seized with vomiting; fever develops rapidly and rises to a high point, and the patient is tormented with violent pains in the head, back, and limbs. The pains and fever continue, strength is rapidly lost, and soon the patient sinks into a condition of stupor or delirium. The tongue is dry and coated; the breath is heavy and offensive; the skin dry and excessively hot, often pungent; the eyes are bloodshot. On the third to the fifth day an eruption of hæmorrhagic spots of dark red "mulberry" color appears in the skin and persists for some days, fading gradually. If the patient survives, about the tenth to the fourteenth day a sudden subsidence of the fever is likely to occur. So sudden is this crisis and so immediate the improvement in the patient's condition in many cases, that some authors have been led to recall the scriptural passage: "On such a day the fever left him and he was well." The mortality in typhus fever is sometimes extremely high, most cases dying of exhaustion, of high fever, or of some complications, such as pneumonia. The treatment simply consists in the control of the fever and in stimulation. Pain may require sedatives.

WILLIAM PEPPER.

Typography: See PRINTING.

Tyr [Icel. *Týr*: O. Eng. *Tiw*; cf. O. H. Germ. *Zio*, Gr. Ζεύς, Lat. *Ju-* in *Jupiter*, *Diespiter*. See TUESDAY]: in Scandinavian mythology, a son of Odin. He is the bold god of war, and heroes pray to him for victory. When the gods were about to put the chain Gleipner on the Fenriswolf, and the latter refused to permit this to be done unless one of them laid his hand on the wolf's mouth as a pledge that no deceit was intended, the only god found willing to make this sacrifice of a hand was Tyr. The third day of the week is called after him, Icel. *Týrsdagr*, *Tysdagr*, Dan. *Tirsdag*, Eng. *Tuesday*. See SCANDINAVIAN MYTHOLOGY.

RASMUS B. ANDERSON.

Tyran'nidæ [Mod. Lat., named from *Tyrannus*, the typical genus, from Lat. *tyran'nus*, tyrant]: a family of clamatorial birds containing the king-bird and related forms. They have ten primaries and twelve tail-feathers; the bill is hooked and flattened, and the bristles about the mouth are well developed. A characteristic feature is the "exaspidian" tarsus, the horny covering consisting of plates separated vertically on the inner side only. Although superficially resembling the Old World fly-catchers (*Muscicapidæ*) in form and habits, they are very distinct and are confined to America, being most numerous in the tropics. See FLY-CATCHERS and KINGBIRD.

F. A. LUCAS.

Tyrant [(with *y* restored from Lat.) from O. Fr. *tiran*, *tirant* (with *t* by analogy of parties. in *-ant*) < Lat. *tyran'nus* = Gr. τύραννος, absolute sovereign or ruler]: a term which, in ancient Greece, did not necessarily designate, as at present, a despotic and cruel ruler. The Greek tyrants were powerful citizens who by force or stratagem assumed the rulership of a state or city without lawful warrant. Sometimes, in seasons of political disturbance, the government of a *tyrannus* was highly beneficial to the state, commercially and socially. Some of the tyrants were men of wisdom and beneficence. But the natural tendency of such an unlawful exercise of power is toward oppression and injustice; hence at present the word tyrant designates a cruel and unjust ruler, whether a lawful king or a usurper.

Tyrant, in ornithology: any one of the TYRANNIDÆ (*q. v.*).

Tyrcon'nel, RICHARD TALBOT, Earl of: politician; b. in Leinster, Ireland, about 1625; descended from an ancient Norman family; became notorious for daring and unscrupulous adventures in London, on which account he was recommended to the exiled princes Charles and James as a suitable person to intrust with a scheme for the assassination of Cromwell; enjoyed great favor at court at the Restoration (1660), when, in order to enable the Duke of York to refuse to marry Anne Hyde, he made oath to personal knowledge of that lady's unfaithfulness to James; filled many posts of profit at court; was arrested and banished as a conspirator against Charles II. 1677; was created by James II., on his accession, Earl of Tyrconnel 1685, and commander of the army in Ireland 1686; dismissed English Protestant officers from the service, replacing them with Irish Roman Catholics; was made lord deputy of Ireland Jan., 1687; proceeded to labor for the repeal of the act of settlement and for the independence of Ireland under the protection of France; formed a large army of native Irish; invited James II. to

Ireland after the Revolution: received him at Cork and accompanied him to Dublin 1689; was present at the battle of the Boyne, but rendered little service; went to France Sept., 1690, and returned with French forces in the spring of 1691. D. at Limerick in Aug., 1691. His second wife was Frances Jennings, sister to the Duchess of Marlborough.

Tyre [Lat. *Tỹrus*, Gr. Τύρος; cf. Heb. *Tsōr*, from Aram. *Tūr*, liter., a rock]: ancient city in Phœnicia, on the Mediterranean; 20 miles S. S. W. from Sidon. It was the wealthiest and most magnificent of the Phœnician cities, and sent out many colonies, of which Carthage was the most important. Hiram, King of Tyre, was the ally and friend of Solomon. It was besieged five years by Shalmaneser and thirteen years by Nebuchadnezzar. Alexander captured it after a siege of seven months (332 B. C.), when the garrison were put to death and 30,000 Tyrians sold as slaves. It was taken by the Saracens (636), by the crusaders (1144), by the Sultan of Egypt (1291), it being first abandoned by its inhabitants, and by Selim I. (1516). The foundation of Alexandria (332 B. C.) was a great injury to Tyre, and the discovery, almost 2,000 years later, of a passage to India by the Cape of Good Hope dealt the finishing blow to its prosperity. Ancient Tyre consisted of two parts, Palæo-Tyre on the mainland and Neo-Tyre on an island. The narrow sound between formed the harbor. The mole constructed by Alexander to the island has through alluvial deposits become an isthmus, and the former island is now a peninsula whereon the miserable modern village of Sour is situated. Numerous ancient remains jut through the soil, and for some distance among the waves foundations are seen. The latter are literally places "for the spreading of nets in the midst of the sea" (Ezek. xxvi. 5). Sour now exports only cotton, tobacco, charcoal, and millstones by the small and shallow harbor on the N. Pop. 4,500, more than half of whom are Mussulmans. E. A. GROSVENOR.

Tyree: See TIREE.

Tyrian Purple: a celebrated dye used by the ancients, and prepared extensively at Tyre from the shellfish MUREX (*q. v.*), from each of which only a minute quantity was obtained at an enormous cost; and hence this color became the symbol of imperial power. Tarentum, the modern *Taranto*, was one of the great murex-fisheries of the Romans, and there they had a number of dyeing establishments. With the decline of the Roman empire the employment of this color ceased. Purple is now obtained from vegetable and mineral sources. See ARCHIL and DYE-STUFFS.

Tyrnau, or **Tirnau** (Magyar, *Nagy-Szombat*): town; in the county of Pressburg, Hungary; 30 miles N. E. of Pressburg, on the Waag Valley Railway. It has several educational institutions, etc.; was formerly a place of some importance, and was known as Little Rome when the Hungarian primates lived here. The university founded in 1635 was removed in 1773 to Pesth. Pop. 10,830.

Tyrol, or **Tirol**, and **Vorarlberg**: province of the Austrian empire, the ancient *Rhætia*; bounded N. by Bavaria, W. by Switzerland, and S. by Italy. Area, 11,324 sq. miles. The country is mountainous throughout, traversed from W. to E. by three lofty chains of the Alps—the Tyrolese Alps in the north, forming the boundary toward Bavaria; the Trentine Alps in the south, on the Italian frontier; and in the middle the Rhætian Alps, the highest of the three ranges, Mt. Ortler rising 12,812 feet and Gross-Glockner 12,457 feet. The valley between the Tyrolese and Rhætian Alps is drained by the Inn, which flows through Bavaria to the Danube; the valley between the Rhætian and Trentine Alps is drained partly by the Adige, an affluent of the Po, partly by the Drave, which flows through Carinthia to the Danube. Much of the surface is covered with perpetual snow, and glaciers descend to between 5,000 and 6,000 feet above the sea. Nearly 40 per cent. is covered with forests, and of the remainder most is pasture-ground. Only a small part is suitable for tillage, but that part is very carefully cultivated. Wheat, rye, oats, and barley are grown, though not enough for home consumption; in the gardens, vineyards, and orchards, mostly situated in the southern valleys, excellent wines, numerous mulberry-trees for the rearing of silkworms, and fine fruits, olives, and figs are raised. The chief industry of the people is the rearing of cattle, especially sheep and goats, which in the summer-time are driven to the pastures just below the snow-line. Salt and iron are produced, and various branches of manufactures are pursued, though mostly on a small scale. The climate is severe in the north and west, but is mild and almost like that of Italy in the south. Canary and other singing birds are extensively raised and exported. Pop. (1890) 928,769, of whom nearly 60 per cent. speak German, the rest Italian or some Romance or Slavonic dialect. Capital, Innsbruck. Of the combined province, Vorarlberg occupies the northwestern corner, and has an area of only 1,007 sq. miles, with a population of 116,073 in 1890. Each element of the province has its own local government. The country was originally inhabited by the Rhæti, a people with uncertain affinities. It was conquered by Drusus and Tiberius, and became thoroughly Romanized, but in 600 it was largely peopled by the Baiuvarii, a Teutonic tribe. In the thirteenth century a part of the province came into the hands of the Counts of Tirol (anc. *Teriolis*), a district near Meran, but it became chiefly consolidated under the Counts of Meran and their descendants. On the failure of the male line the province was made over to the house of Hapsburg, to which it has since belonged, except during the period 1805–14, when it was in the possession of Bavaria. The inhabitants vigorously resisted the latter power, and were for a time successful in a revolt under the leadership of HOFER (*q. v.*) in 1809. Revised by M. W. HARRINGTON.

Tyrone': an inland county of Ireland, in the province of Ulster. Area, 1,260 sq. miles. The surface is hilly, rising into mountains in the north and south, and declining to a level toward Lough Neagh, which forms part of the eastern boundary. The principal rivers are the Blackwater and the Foyle, with their tributaries. In the hilly districts the soil is sandy or gravelly; in the valleys it is more productive. Oats and potatoes are the common crops. A small coal-field is worked, and some manufactures of linens, woolens, whisky, earthenware, etc., are carried on, though on a limited scale. The principal towns are Strabane, Dungannon, Cookstown, and Omagh. Pop. (1891) 171,701, of whom 93,569 were Roman Catholics, 38,909 Episcopalians, and 33,710 Presbyterians.

Tyrone: borough (incorporated in 1857); Blair co., Pa.; on the Little Juniata river and three branches of the Penn. Railroad; 14 miles N. N. E. of Altoona, and 55 miles S. W. of Lock Haven (for location, see map of Pennsylvania, ref. 5–D). It contains 10 churches, 25 public schools, 3 parochial schools, a national bank with capital of $100,000, a private bank, 3 building and loan associations, and a daily and 2 weekly newspapers. The borough has a large general trade with the surrounding country and extensive manufactories, including iron-works, railway-shops, paper-mill, flour-mills, boiler-works, foundry and machine-shops, planing-mills, brick-works, tannery, and box and candy factories. Pop. (1880) 2,678; (1890) 4,705; (1900) 5,847.

EDITOR OF "HERALD."

Tyrone, HUGH O'NEILL, Earl of: Irish rebel; son of an illegitimate son of the first Earl of Tyrone; b. in Ireland about 1550; commanded a troop of horse in the service of Queen Elizabeth in the war against the rebel Earl of Desmond 1579–83; received from the Irish Parliament in 1587 the title of Earl of Tyrone; obtained by a personal visit to the English court the restitution to himself of the confiscated estates of the rebel Shan O'Neill (d. 1567); maintained a correspondence with the English Government while conspiring against it; formed an alliance with Red Hugh, the chief of the O'Donnells, 1590; assumed the title of The O'Neill; offered the sovereignty of Ireland to Philip II. of Spain; defeated Sir John Norris, and was proclaimed a traitor 1597; defeated and killed Sir H. Bagnal at the Yellow Ford Aug. 14, 1598; concluded a truce with the Earl of Essex Sept. 8, 1599; retreated from Munster before Lord Deputy Mountjoy 1600; successfully invoked the aid of Spain, but was defeated with his Spanish allies in an attack upon Kinsale Dec., 1601, and took refuge in a stronghold near Longh Erne; surrendered to Mountjoy; renounced the title of The O'Neill; received a pardon 1602; presented himself to King James, and was confirmed in his earldom and estates 1603; was suspected in 1607 of being engaged in a new conspiracy, though the charge was probably false; proceeded to Brussels to invoke the protection of the Spanish Government, and spent the remainder of his life in obscurity and poverty, a pensioner of the King of Spain and of the pope. D. in Rome in 1616.

Ty'rosine [from Gr. τυρός, cheese]: a nitrogenous substance ($C_9H_{11}NO_3$) formed by the decomposition of albuminoid bodies by acids, alkalies, and putrefaction. It was first obtained by decomposing casein with fusing potash. It can

also be prepared by boiling clippings of horn in dilute sulphuric acid and by concentration allowing the leucine and tyrosine to crystallize out; the latter is then separated by recrystallization. It occurs ready formed in the animal organism (in the spleen and the pancreas, and in the urine in cases of yellow atrophy of the liver; sometimes in the liver and bile of diseased persons). It occurs also in crayfish, caterpillars, spiders, etc., and in the vegetable kingdom, being found in the pumpkin and the white sprouts of vetch. Tyrosine crystallizes from an aqueous solution in slender silky needles, arranged in a stellate form. It dissolves in boiling water and in alcohol, but is insoluble in ether.
Revised by IRA REMSEN.

Tyrotoxicon: See CHEESE.

Tyrrhenia: See ETRURIA.

Tyrrhe'nian Sea: the ancient *Mare Tyrrhenum*; that part of the Mediterranean which lies between the Italian mainland and the islands of Sardinia, Corsica, and Sicily.

Tyrtæ'us (in Gr. Τυρταῖος): Greek lyric poet; flourished at the time of the second Messenian war, in the latter half of the seventh century B. C. According to Attic tradition, he was a native of Aphidna, in Attica, a lame schoolmaster who was sent by the Athenians to Sparta when the Lacedæmonians, at the bidding of the Delphic oracle, asked the Athenians for help. The lameness is symbolic of the elegiac distich, one verse of which is shorter than the other, and schoolmaster is synonymous with poet. But the whole story is doubtless a late invention. The stirring elegies of Tyrtæus and his spirited marching songs (ἐμβατήρια) woke the Lacedæmonians to wiser counsels and higher courage, and made them victorious over their old foes. The fragments of his poems keep their primal fire, and his name has become typical for the warrior poet everywhere. Fragments in Bergk's *Poetæ Lyrici Græci* (4th ed.), vol. ii., pp. 8–22. B. L. GILDERSLEEVE.

Tyrwhitt, ter'it, THOMAS, F. R. S.: classical scholar; b. in London, England, Mar. 29, 1730; educated at Eton; graduated at Oxford, 1750; became fellow of Merton College and Under-Secretary of State in the War Department 1756, and clerk to the House of Commons 1762; resigned the latter post 1768; devoted himself to literary criticism, and was appointed one of the curators of the British Museum in 1784. D. in London, Aug. 15, 1786. Among his works were *Observations on some Passages of Shakespeare* (1766); a celebrated edition of *Chaucer* (1773); critical dissertations on Babrius, Euripides, Aristophanes, and Strabo, and editions of the *Orphica*, of Isæus, and especially of Aristotle's *Poetics* (posthumous, 1794). He is best remembered, however, as the original editor of Rowley's *Poems*, to which he furnished a preface and glossary, and subsequently added an appendix showing them to have been written by Chatterton.
Revised by A. GUDEMAN.

Tyssens, PETER: historical and portrait painter; b. in Antwerp in 1624; d. in the same place between 1677 and 1679. Among his works may be mentioned *Apparition of Christ* and *Apparition of the Virgin*, in the Antwerp Museum, and *Adoration of the Host* in St. James's church, Antwerp.—His son PETER PAUL TYSSENS (b. 1652) was also a painter. See Descamps, *Vies des Peintres Flamands*.

Tytler, ALEXANDER FRASER, Lord Woodhouselee: historical writer; son of William Tytler (1711–92); b. in Edinburgh, Scotland, Oct. 15, 1747; educated at Kensington and at the High School and University of Edinburgh; was called to the bar 1770; appointed to the chair of History at the University of Edinburgh in 1780; became judge-advocate of Scotland 1790, lord of session, with the title of Woodhouselee, 1802, and a lord of justiciary 1811. He wrote, besides many other works, *Essay on the Principles of Translation* (1791; 3d ed. 1813); *The Elements of General History, Ancient and Modern* (2 vols., 1801); and *Lives* of Lord Kames (2 vols., 1807) and of Petrarch (1810). D. in Edinburgh, Jan. 5, 1813.

Tytler, PATRICK FRASER: historian and biographer; son of Alexander Fraser; b. in Edinburgh, Scotland, Aug. 30, 1791; educated at the High School and University of Edinburgh; studied law; was admitted into the faculty of advocates 1813; held for some years the office of king's counsel in exchequer, but ultimately devoted himself to biographical and historical researches, and received from 1844 a pension of £200 from the crown. D. at Great Malvern, England, Dec. 24, 1849. His principal works were *Lives* of *James Crichton of Cluny, commonly called the Admirable Crichton* (1819); *Sir Thomas Craig of Riccarton* (1823); *John Wicklyff* (1826); *Scottish Worthies* (3 vols., 1832–33); *Sir Walter Raleigh* (1833); *King Henry the Eighth* (1837); *An Historical View of the Progress of Discovery on the Northern Coasts of America, etc.* (1832); and a *History of Scotland from 1149 to the Union of the Crowns in 1603* (Edinburgh, 9 vols., 1828–43; 5th ed. 10 vols., 1866), a work pronounced by Earl Stanhope and other critics "the standard history of Scotland." Like his grandfather, he was a stanch advocate of Mary Queen of Scots. See the memoir entitled *The Portrait of a Christian Gentleman*, by Rev. John W. Burgon (1859). Revised by H. A. BEERS.

Tyumen: See TIUMEN.

Tzana: lake of Abyssinia. See DEMBEA.

Tzet'zes, JOHANNES: Byzantine author; flourished during the last half of the twelfth century. The poems *Iliaca* (edited by Jacobs 1793 and Bekker 1816) and *Chiliades* (edited by Kiessling 1826) are his principal works. Dull, verbose, and pedantic, his commentaries on the classic poets are valuable for their extensive learning. His brother, ISAAC, was also a commentator on the classics. E. A. G.

Tzschirner, tshĕer'ner, HEINRICH GOTTLIEB: theologian; b. at Mittweida, Saxony, Nov. 14, 1778; studied theology at Leipzig; was appointed Professor of Theology at Wittenberg in 1805 and at Leipzig in 1809, and was elected superintendent at Leipzig in 1815, and prebendary of Meissen in 1818. D. in Leipzig, Feb. 17, 1828. He acquired great reputation as a preacher and by the firm and intelligent opposition he offered to the Roman Catholic reaction all around him. He was a moderate rationalist, and was a prominent man in his time. He wrote *Leben und Ende merkwürdiger Selbstmörder* (Weissenfels, 1805); *Geschichte der Apologetik* (Leipzig, vol. i., 1805; all published); and against Roman Catholicism. He is remembered mainly by his continuation of Schröckh's *Kirchengeschichte*, vols. ix. and x. (1810–12) and *Der Fall des Heidenthums*, the product of ten years of labor, and still quoted (posthumous, edited by C. W. Niedner, vol. i., 1829; all published). See his *Life*, by H. G. Tzschirner (1828). Revised by S. M. JACKSON.

Tzŭ-Hwui: See CHINESE LANGUAGE.

U

: the twenty-first letter of the English alphabet.

Form.—The form U is derived through the Roman V from the Greek upsilon, Υ, a variant form of Y. As a sign for the vowel *u* this symbol was not used in the Semitic alphabets, but in the form Y appears as the sixth symbol in the Phœnician series, i. e. in the place afterward occupied by F, the Greek digamma. The Greek alphabet, in its effort to supply the Phœnician lack of vowel-signs, used the Υ (= semivowel *w*) as a vowel, placing it at the end of the series, and left in its place as a consonant a form, F, differentiated out of the preceding sign ϝ by the omission of one of the strokes. This addition of *upsilon* to the series in the place after *tau* occurred before the division of the Greek alphabets into groups, as this symbol, holding the twenty-third place, is characteristic of all the groups.

Name.—The common Greek name of the letter, *upsilon* (ὗ ψιλόν), "mere *u*," "single *u*," is not old, but dates from Byzantine times, and applies to the discrimination between the digraph οι and the single letter υ, which at that time had come to be pronounced alike, viz., as *ü* or *i* in French. The old Greek name was ὗ. The English name *yoo* (phonet. *yū*) represents the Old French *ū* (< Lat. *ū*), with development of *y*-sound as in *use, cure, human.*

Sound.—The letter stands regularly for the sounds (1) *yu* (*yoo*), as in *mule, usage, impugn, value, circular*; (2) *oo*, as in *rule, rude, rural*; (3) *ŏŏ*, as in *bull, pull, put*; (4) *ė* (*əə*), as in *murmur, urn, fur*; (5) *ŭ* (unrounded), as in *tub, bud, under.* It also has the sound of *ĭ* in *busy, lettuce, minute*, and has the consonant value of *w* between *q* or *g* and a vowel, as in *quality, language, sanguine.* It is silent, e. g. in *biscuit, circuit, rogue, guess, build.*

Source.—The sound *yu* (*yoo*) has its main source in French *u*. The sound *oo* (*ū*), more frequently written with *o o*, is treated under O; so also the sound *ŏŏ*. The sound *ŭ* has the following main sources: (1) O. Eng. *ŭ* < Teuton. *ŭ*; as *sung* < O. Eng. *sungen* : Goth. *suggwans*; *spun* < *spunnen* : Goth. *spunnans*; *thunder* < *þunor*; (2) O. Eng. *ū* (< *ūn*) < Teuton. *un*; as *us* < *ūs* : Germ. *uns*; (3) O. Eng. *ū* < Teuton., as *but* < *būtan*, cf. Goth. *ūt*; thumb < *þūma*, cf. Germ. *daumen*: (4) O. Eng. *ō* < Teuton. *ō*, as *must* < *mōste*, Goth. *gamōtan*; (5) O. Fr. *u*, as *suffer* < *suffre*, *butler* < *buteler.*

Symbolism.—U = uranium (chemistry); U. C. = Upper Canada; U. S. = United States; U. S. N. = United States navy. See ABBREVIATIONS. BENJ. IDE WHEELER.

Uaupés: See RIO NEGRO (Brazil).

Uber'ti, FAZIO, degli: poet (proper name BONIFAZIO); b. at Pisa between 1305 and 1309; a member of the family of the Uberti, who in the thirteenth century had been the leaders of the Florentine Ghibellines; entered the service of the Scaligers and other noble families; wandered about much, even into France and Germany, leading a wild life until near his fortieth year. D. after 1368. His *Dittamondo*, composed after 1350 in imitation of Dante's *Divina Commedia*, is a poem in *terza rima*, in which he fancies himself guided about the world by the geographer Solinus, and instructed in the history of various places. It was not finished (1st ed. Vicenza, 1474). His lyrical poems, containing many pleasing love verses, have been edited by R. Renier: *Liriche edite e inedite di Fazio degli Uberti, etc.* (Florence, 1883). See Th. Paur, *Fazio degli Uberti, ein Epigone Dante's*, in *Neues Lausitzisches Magazin*, lxvii., 2 ff.; article by Renier in *Giorn. di Filol. rom.*, iii. J. D. M. FORD.

Ucayali, oo-kăă-yaa'lĕĕ: a river of Peru, one of the great southern tributaries of the Amazon, and by many regarded as its true head. It is formed by the union of the Mantaro, Apurimac, Vilcamayu, and Paucartambo, all of which rise on or near the eastern side of the western cordillera, and after flowing through the high sierra region break through the Andes in narrow cañons. The Mantaro, called in its upper course the Jauja and Ancas-yacu, has its source in Lake Junin near the head-waters of the Marañon, and flows at first S. E., turning abruptly N. and N. E. The Apurimac rises near 14° 30′ S., S. E. of Cuzco, flows N. W., and joins the Mantaro after cutting through the Andes. The Vilcamayu rises in the Vilcañota cross range close to the Titicaca basin, and it receives the Paucartambo, which rises near the sources of the Madre de Dios. Collectively these rivers water the finest and most thickly settled part of Peru, and after passing the Andes all of them become navigable. In Peru the name Ucayali is given only to the united flood, which lies entirely in the lowlands and has a general northern course, though with many windings; the whole of it has been navigated by Tucker and others with small steamers, and its length is calculated at over 1,000 miles. Its course is through a forest-covered plain, and it is frequented only by rubber-gatherers and a few wild Indians; ultimately it must become the great eastern outlet of Peru. Entire length, with the Apurimac, nearly 1,500 miles. See Castelnau, *Expédition dans les parties centrales de l'Amérique du Sud* (vol. iv., 1851); the reports of Tucker; Löffler, in *Petermanns Mittheilungen* (1886, part i.). HERBERT H. SMITH.

Uccello, ŏŏt-chel'lō, PAOLO: painter; b. in Florence, Italy, in 1397. His family name was DONO, but from his love of painting birds he was called *Uccello*. After practicing the goldsmith's art he became an assistant of Lorenzo Ghiberti at the time the latter was working on the doors of the baptistery at Florence. The frescoes Uccello painted in the cloisters of Sta. Maria Novella in Florence have been almost entirely effaced by time. A colossal equestrian portrait of Sir John Hawkwood in chiaroscuro in *terra verde* is in the Duomo of Florence; also some giants in the same method in the Casa dei Vitaliani at Padua, which Vasari tells us were much admired by Mantegna. Uccello was much devoted to geometry and perspective, but, according to Vasari, the study of these branches made him "more needy than famous." D. in Florence, Dec. 11, 1475. The Louvre possesses a picture on panel by Uccello containing portraits of Giotto, Donatello, Brunellcschi, Giovanni Manetti, and himself. The National Gallery also has pictures by this master. See Gaye, *Carteggio inedito d'Artisti* (vol. i., p. 146) and Milanesi's edition of Vasari's *Lives of the Painters.* W. J. STILLMAN.

U'chean Indians: a linguistic stock of North American Indians which must have been divided into many tribes living distant from one another at an early period, but of whose tribal names none has come down to us except that of Yuchee or Euchee. They were scattered through parts of South Carolina, Georgia, and Florida at the time of de Soto's expedition, and reached Alabama not earlier than 1729. The center of their early settlements appears to have been the lower Savannah river. In bodily size they are smaller than the Creeks, but lithe, active, and wiry. In settling private disputes they are the most pugnacious of the Indians S. of the Appalachian ridge, and, although members of the Creek confederacy, never were friendly to those tribes. In revenge for this the Creeks regarded them as slaves, and antagonize them even yet. Regarding their ancient customs and rites, they are more conservative than any other of the southern tribes. They attribute their origin directly to the sun; historically they never appear as acting in a body, but only as detached, a single tribe inhabiting a village on the lower Tallapoosa river, another on the Chattahoochee, three on Flint river and its side creeks, several on the Savannah river, on the watercourse of Southern Georgia, and on the coast tracts of South Carolina. After 1835 they removed with the Creek Indians to the Indian Territory, where they are now settled S. of the Arkansas river to the number of over 600. See Bartram, *Travels through North and South Carolina, etc.* (Philadelphia, 1791, and later editions); Hawkins, *A Sketch of the Creek Country, etc.* (New York, 1848; Savannah, 1848). See INDIANS OF NORTH AMERICA. J. W. POWELL.

U'dall, NICHOLAS: author and divine; b. in Hampshire, England, in 1505 or 1506; educated at Corpus Christi College, Oxford (graduated in 1524), where he became a fellow; wrote verses for the city of London pageant at the coronation of

Queen Anne Boleyn, May, 1533; took orders in the Church of England; was a zealous advocate of the Reformation; was master of Eton School 1534–43, where he was noted as a severe disciplinarian; published *Ftovres for Latin Spekynge, Selected and Gathered out of Terence, and the same translated into Englysshe* (1533); wrote several Latin and English plays to be performed by his pupils, one of which, *Ralph Roister Doister*, probably produced as early as 1540, though not printed until 1565, is memorable as the earliest English comedy known to be extant. Udall was dismissed from the mastership of Eton in 1543 in consequence of having removed from the chapel some silver images —a proceeding for which he was charged with robbery by his Roman Catholic adversaries; was vicar of Braintree, Essex, 1537–44; entered the service of Queen Catharine Parr; obtained on the accession of Edward VI. the rectory of Calborne in the Isle of Wight; edited, with a dedication to the Queen Dowager Catharine, *The First Tome or Volume of the Paraphrase of Erasmus upon the New Testament* (1549), translated partly by himself, partly by the Princess Mary, afterward queen, whose tutor he seems to have been; became canon of Windsor 1551–56, and head master of Westminster School 1555, and wrote for the queen's entertainment various *Dialogues and Intertudes*. D. at Windsor in Dec., 1556. He was author of several schoolbooks and of some poems, and translated Latin works of Peter Martyr and others. No copy of his *Ralph Roister Doister* was known to exist until 1818, when it was discovered and reprinted by Rev. Mr. Briggs; was again issued, with notes, by F. Marshall (1821), by Thomas White in his *Old English Drama* (1830), by William Durant Cooper (1847), who edited it for the Shakspeare Society, prefixing an elaborate *Life* of Udall, and by Arber in his series of *English Reprints* (1869). It was identified as the earliest English comedy (a distinction previously accorded to *Gammer Gurton's Needle*) by J. Payne Collier in his *History of English Dramatic Poetry* (1831), by means of a quotation from it found in the *Arte of Logique* (1551) of Sir Thomas Wilson. The name of Udall also occurs under the forms *Owdall*, *Dowdall*, *Woddall*, *Uvedale*, and *Vuedale*. Revised by H. A. Beers.

Udine, oo'dĕe-nā (anc. *Vedinum*): capital of the province of Udine, Northern Italy; at the foot of the Alps, 354 feet above the sea, and 25 miles from the Adriatic (see map of Italy, ref. 2–E). It is nearly circular, handsomely built, with clean and commodious streets and large squares flanked with fine porticoes. It has many forges and foundries, and manufactures oils, matches, silk and cotton thread and tissues, dyes, leather, and furniture. The castle near the center of the city, now used for military purposes, was designed by G. Fontana, and occupies the site of a still earlier castle which was destroyed by an earthquake. The municipal palace, built in 1457, was damaged by fire in 1876, but has been restored, and is a very fine Gothic building, resembling the ducal palace of Venice and very rich in frescoes. The episcopal palace has frescoes by Giovanni da Udine. The Metropolitana (1236), injudiciously restored, except the west front, in 1706, contains some admirable pictures, and there are many other interesting churches. The Bartoliniana Library and that of the Casa di Florio are very rich. Udine first appears historically in the ninth century; was governed for a time by the patriarchs of Aquileia; was long the chief city of the duchy of Friuli, and formed an important portion of the Venetian republic when the latter fell. It is now an active center of industry and traffic. Pop. of commune (1893) 36,600. Revised by M. W. Harrington.

Udine, Giovanni, da: painter; b. at Udine, Italy, Oct. 27, 1487, of a family bearing the name of Ricamatori, perhaps from their skill at embroidery. He studied at Venice with Giorgione; afterward went to Rome with an artist called il Morto da Feltre, who invented a new kind of grotesque decoration which Giovanni practiced also. In Rome he became an assistant to Raphael in the decoration of the loggie of the Vatican and the Sala dei Pontifici in the Vatican; he painted the musical instruments in Raphael's *Santa Cecilia*. He was the first to make grotesque decorations in stucco, and became famous for his graceful productions. After the sacking of Rome he wandered about in Italy, returning to his native city, whence Clement VII. called him to Rome again to paint the standards for the castle of S. Angelo. Rewarding the artist with a pension, Clement also sent him to Florence to work in the sacristy of San Lorenzo. During the time Giovanni was thus occupied the pope died, and Giovanni, disgusted with ill fortune, returned to Udine, where he married and settled, executing works for his native city, also a chapel of Sta. Maria of Cividale. In the year 1550 he returned to Rome as a pilgrim, where Giorgio Vasari procured for him the renewal of the pension which Clement VII. had given, as he was then in great poverty. D. in Rome in 1564. W. J. Stillman.

Ueberweg, ü'ber-vech, Friedrich: classical scholar; b. at Solingen, Rhenish Prussia, Jan. 22, 1826; studied at Göttingen and Berlin. In 1861 the Vienna Academy awarded him the first prize for his treatise entitled *Untersuchungen über die Echtheit und Zeitfolge Platonischer Schriften und über die Hauptmomente aus Plato's Leben*, a work which secured him a call to the chair of Philosophy at Königsberg, where he died June 7, 1871. He edited the *Poetics* of Aristotle with a German translation, but is chiefly noted as the author of a valuable *System der Logik*, and of a standard work on the *History of Philosophy from Thales to the Present* (3 vols., 1863; 7th ed., by M. Heinze, 1888) which, although primarily intended for students, embodies considerable original research. See *Friedrich Ueberweg*, by F. A. Lange (Berlin, 1871). Alfred Gudeman.

Ufa: government of Eastern Russia; area, 47,112 sq. miles. It extends along the rivers Ufa and Belaia, which flow to the Ural, and is to a great extent covered by branches of the Ural Mountains, but the western part is a great plain extending to the Kama river. The ground is well supplied with forests, and the rich soil is largely devoted to agriculture, so that much grain is exported. Bee-keeping and cattle-raising are carried on, though the cattle are fewer than formerly. The climate is cold but healthful. Mining is an important branch of industry; gold, lead, copper, and especially iron, are mined in large quantities, and of superior quality. The transit trade between Europe and Asia, or rather between Nijnii-Novgorod and Bokhara, is important. Pop. (1897) 2,219,838. Capital, Ufa.
Revised by M. W. Harrington.

Ufa: capital of the government of Ufa, Eastern Russia; on the Ufa, at its influx in the Belaia; 200 miles N. of Orenburg (see map of Russia, ref. 7–H). It has several good educational institutions, some manufactures, and an active trade. Pop. (1897) 50,576.

Ugan'da: long famous as the most powerful native kingdom of the lake region of Central Africa; lying on the northern and western sides of Victoria Nyanza. Bordered on the E. by the Nile, its northern limit is, approximately, in the same latitude as Lake Gita. W. of Victoria Nyanza, it includes about half the territory between that lake and Lake Albert Edward, being limited on the S. by the Kagera river; also the Sesse archipelago and other islands in Victoria Nyanza. It consists of undulating uplands, in part well timbered, and so high above the sea that the climate is fairly salubrious, though under the equator. The soil is very fertile, and the plantations are devoted chiefly to the culture of the banana, plantain, maize, and yam, which form the larger part of the food-supplies, though beef, goat's flesh, and fish are also eaten. One family has reigned in Uganda for over three hundred years, and the king, though he has been shorn of almost all his authority by the British, who are now in possession, is still regarded with superstitious reverence by many of the peasantry. The people belong to the Bantu family of African tribes, and are much higher in intellectual development and civilization than any other Central or East Africans. They are fully clad, are skilled in brass, iron, and copper working, and were a prosperous and very numerous people when discovered by Speke (1862) and described by Stanley (1875). For a number of years after 1884 the country was greatly exhausted by desperate civil wars and by the attempt of the king, Mwanga, to extirpate Christianity by wholesale massacres. Christianity, however, has taken a firm hold upon the country, which is (1895) divided into three political and religious parties, the Mohammedans, Catholics, and Protestants. Peace is fairly well maintained only by means of a native military force in the service of Great Britain. The population is not over 500,000, less than half what it was at about 1875. The British Government decided (June, 1895) to build a railway from Mombasa, on the Indian Ocean, 800 miles away, and a preliminary survey has been made. The country is of great strategical importance, as it dominates Lake Victoria and controls the head-waters of the Nile. See Speke's *Journal of the Discovery of the Source of the Nile*; Stanley's *Through the Dark Continent*; Ashe's *Two Kings of Uganda*; and Stock's *The Story of Uganda*. C. C. Adams.

Uglitch': town; in the government of Yaroslav, Russia; on the right bank of the Volga; 60 miles W. S. W. of the city of Yaroslav; contains many fine buildings (see map of Russia, ref. 6–E). It has extensive tanneries and some other manufactories. Pop. (1888) 14,172.

Ugoli'no da Siena: a name borne by four painters, natives of Sienna, living in the fourteenth century. Vasari tells us that one of them was an intimate friend of Stefano Fiorentino (nephew and pupil of Giotto). This Ugolino was much employed in Italy. He retained the Byzantine style, and followed Cimabue rather than Giotto; he is said to have painted the high altarpiece in Santa Croce of Florence, and other works there, also the altar-piece in Santa Maria Maggiore, and a Madonna in Or San Michele. Only the first mentioned of these works exists, and that one only in part and not in its original place, nor all its parts together. Two pictures in the National Gallery in London are supposed to be parts of its predella. See Vasari (Milanesi's edition, vol. i.); *Catalogue* of the National Gallery, London (1889). W. J. STILLMAN.

U'grians: common name for a Finnish stock inhabiting parts of the government of Tobolsk, Siberia. They speak a primitive Finnic dialect, much mixed, however, with Tartar elements, and occupy a very low stage of civilization. They are nominally Christians, but their religion is really a mixture of Christianity and Shamanism. They are nomads, and hunting and fishing are their chief occupations.

Uhehe, oo-hā'hā: a warlike tribe of Africans occupying a considerable area between lat. 7° and 9° S. and lon. 35° and 37° E., on the middle Rueha and upper Uranga rivers. In 1891 they defeated with considerable loss of life a German expedition under Lieut. von Zalewski, and in 1892 sacked the German trading-station of Mpuapua, in the Usagara country, 50 miles N. of their usual limits. M. W. H.

Uhland, oo'lănt, LUDWIG: poet and scholar; b. at Tübingen, Germany, Apr. 26, 1787; studied law at the university of his native city; went to Paris in 1810 for the purpose of studying Old French and Old German manuscripts; practiced law in Stuttgart 1812–30; was elected to the Würtemberg assembly in 1819; was appointed Professor of the German Language and Literature at Tübingen in 1830, but resigned in 1833; became a member of the national assembly of Frankfort-on-the-Main 1848; retired to private life; d. Nov. 13, 1862. Among the great lyric poets of Germany in the nineteenth century Uhland takes a foremost place. At the beginning of his poetic career he was deeply influenced by the romantic school, but he kept himself free from the fantastic extravagances of this school. While the latter looked upon the Middle Ages with a vague enthusiasm and an undue overestimation, Uhland's love for mediæval German life and poetry resulted from an intimate knowledge of both, which was based upon thorough studies. Whenever he, therefore, undertakes to revive the German antiquity in his poetry, his productions bear the stamp of truthfulness, besides being the works of a great poet schooled in the art of Goethe. Most of his lyric poetry can be compared only with Goethe's songs and the best of the Volkslied, and so perfectly did he know how to reproduce the spirit of the latter that many of his poems became folk-songs. As a writer of ballads he has few equals in German literature. But while these ballads, which are classic specimens of their kind, are full of dramatic power, his dramas, *Herzog Ernst* (1818) and *Ludwig der Bayer* (1819), though highly poetical in many passages, are lacking the true dramatic effect. During the latter part of his life Uhland devoted himself exclusively to scientific research in the fields of literature and mythology, and the results of his investigations are collected in the *Schriften zur Geschichte der Dichtung und Sage*, published after his death (8 vols., 1865–72). Among these the essay *Ueber das altfranzösische Epos* (1812), the excellent biography of Walther von der Vogelweide (1822), the treatise *Ueber den Mythus von Thor* (1836), and the classical collection *Alte hoch- und niederdeutsche Volkslieder* (1844) may be mentioned especially. Equally great as a poet and scholar, Uhland also played a conspicuous and noble part in politics, and his activity in the latter field shows the same devotion, simplicity, and manliness which characterize his entire career. See Fr. Vischer, *Kritische Gänge*, iv., 97; H. v. Treitschke, *Historische und politische Aufsätze*; O. Jahn, *Ludwig Uhland* (Bonn, 1863); F. Notter, *Ludwig Uhland* (Stuttgart, 1863); *Ludwig Uhlands Leben, von seiner Wittwe* (Stuttgart, 1874); H. Fischer, *Ludwig Uhland* (1887); Dederich, *Uhland als Dichter und Patriot* (Gotha, 1886); E. Paulus, *Ludwig Uhland und seine Heimat* (Tübingen, 1887).

Uhle, ALBRECHT BERNHARD: See the Appendix.

Uhrich, JEAN JACQUES ALEXIS: general; b. at Pfalzburg, Lorraine, then in France, Feb. 15, 1802; educated at the Military Academy of St.-Cyr, France; served in the campaign of 1823 in Spain; afterward in Africa; attained the rank of brigadier-general in 1852; served with distinction in the Crimean war, where he became general of division, and in Italy in 1859; became grand officer of the Legion of Honor in 1862; transferred to the reserve in 1867; resumed active service at beginning of war between France and Germany, and commanded at Strassburg. This important strategic point was ill fortified, and held but a small garrison. In Aug., 1870, it was invested by the Germans, who, upon Uhrich's refusal to surrender, began a destructive bombardment, in the course of which 200,000 projectiles were thrown against the city. Uhrich's brave resistance lasted till Sept. 27, 1870, when, convinced of its uselessness, he surrendered. For his services he was rewarded with the Grand Cross of the Legion of Honor. He is the author of *Documents relatifs au Siège de Strasbourg* (1872). D. at Passy, France, Oct. 9, 1886.

Uhrichsville: city (founded as Waterford in 1833, name changed in 1839); Tuscarawas co., O.; on the Stillwater creek, and the Cleve., Lorain and Wheel., and the Pitts., Cin., Chi. and St. L. railways; 99 miles N. E. of Columbus, and 101 miles S. of Cleveland (for location, see map of Ohio, ref. 4–H). It is in an agricultural and wool-growing region, and has 6 churches, several public schools, electric street-railway, 2 private banks, 2 weekly newspapers, and manufactures of sewer-pipe, drain-tile, and fire-brick. Uhrichsville with the village of Dunnison adjoining practically form one city, with a local and suburban population of 8,000 to 10,000. Pop. (1880) 2,790; (1890) 3,842; (1900) 4,582.
EDITOR OF "TUSCARAWAS CHRONICLE."

Uist, wist, **North** and **South**: two islands of the Outer Hebrides, belonging to Scotland. North Uist is 18 miles long and from 3 to 13 miles broad, with 3,371 inhabitants. South Uist is 20 miles long and 7 miles broad, with 3,825 inhabitants. Both islands are high and rocky, and ill suited for agriculture; fishing is the principal business.

Uitlanders: See the Appendix.

Ujiji, oo-jee'jĕe: a place in Africa, consisting of a number of mud huts, and situated on the shore of Lake Tanganyika, in a district of the same name, in lat. 4° 58′ S., lon. 30° 4′ E. (see map of Africa, ref. 6–F). It became noted as the point where Stanley met Livingstone on Nov. 10, 1871.

Ujina: a port situated in the inland sea of Japan, close to the city of HIROSHIMA (*q. v.*) and to the naval station of Kure, where is located the Imperial Naval College, removed thither in 1890 from Tokio (see map of Japan, ref. 7–B). The port admits the largest vessels, and was the center of naval activity in the war with China in 1894–95. The court moved westward in the summer of 1894 to Hiroshima, as a safer and more convenient locality for directing warlike operations. J. M. DIXON.

Ukerewe, oo-keĕr-yu': native name for the great African lake called VICTORIA NYANZA (*q. v.*).

Uki'ah: city (founded in 1857); capital of Mendocino co., Cal.; on the Russian river, and the San Fran. and N. Pac. Railway; 121 miles N. W. of San Francisco (for location, see map of California, ref. 5–B). It has a picturesque location; contains 3 public schools, a State bank with capital of $250,000, a private bank, the Sacred Heart Convent of Mercy, and 2 weekly newspapers; and is engaged in agriculture, fruit, hop, and wool growing, lumbering, and stock-raising. Pop. (1880) 933; (1890) 1,627; (1900) 1,850.
EDITOR OF "REPUBLICAN PRESS."

U'kraine (the frontier-land): the name commonly given to that easternmost portion of Poland which, extending on both sides of the Dnieper along its middle course, and conquered by the Poles in 1320, formed the frontier of the Polish empire against the Tartars; it hardly ever signified a political division with precisely defined boundaries, but it soon became a matter of contention between Russia and Poland. In 1654 ten Cossack tribes settled on the eastern bank of the Dnieper, fell away from the Polish crown, and surrendered themselves to Russian authority. By the Treaty of Andrussow (1667), and finally by the Peace of Grzymultowsk (1686), this territory was ceded by the Poles and annexed to Russia

under the name of Russian Ukraine, or Little Russia. The rest of the country, situated on the western bank of the Dnieper, remained with Poland, under the name of Polish Ukraine, until the second division of Poland, when Russia took the whole and divided it into various governments.
Revised by M. W. HARRINGTON.

Ulcer [from Fr. *ulcère* < Lat. *ul'cus*, *ul'ceris*, sore, ulcer; cf. Gr. ἕλκος, wound, sore, ulcer]: a localized disintegration on one of the external or internal surfaces. Two processes are concerned in ulceration: the molecular death of part of the surface involved, and inflammatory conditions at the base and sides. The causes of ulceration are those of inflammation, with an added element of poor reaction on the part of the tissue involved. Local injuries, as by pressure, foreign bodies, as splinters and the like, are the immediate exciting cause in external ulcers. Internally, as in ulcers of the mouth, stomach, or intestines, the immediate exciting cause is either injury by foreign bodies or by micro-organisms and decomposed secretions or other contents. To make the exciting causes spoken of operative to the production of an ulcer, diminution in the resisting power or reparative activity of the tissues is necessary. This explains the occurrence of ulcers on the lower extremities in old people when the veins are varicosed and the circulation therefore sluggish; in the rectum in case of hæmorrhoids; in anæmic, debilitated, or syphilitic subjects; in parts of the body exposed to constant wetting; and in tissues where the nerve tone is lowered, as in paralyzed parts.

The appearance of ulcers varies greatly in different cases. In general there is an irregular excavation, with a base covered with pus and showing small red elevations, the inflammatory granulations by which nature repairs the injury. According to the variations from this general appearance and from the greater or less tendency to heal there are described: (1) *Indolent ulcers*, in which the base and edges are hard and healing is very slow; they are common on the legs of old people; (2) *irritable ulcers*, which are painful and bleed easily; (3) *inflamed ulcers*, in which from irritation active inflammation is evident; (4) *sloughing ulcers*; (5) *serpiginous ulcers*, in which there is a tendency to spread in a serpentine fashion; (6) *phagedemic ulcers*, in which great tissue destruction occurs; (7) *œdematous ulcers*, which are moist and boggy; and (8) *fungating ulcers*, in which the granulations in the floor of the ulcer grow excessively. Other terms, such as *specific*, *epitheliomatous*, and the like, are in use, but do not belong to the anatomical classification given above.

There are certain parts of the body specially liable to ulcer formation. Such are the lower part of the legs, the mouth, the stomach, the intestines (especially in typhoid fever and in tuberculosis), and the rectum.

The tendency of ulcers is to get well spontaneously. Nature is best assisted by cleanliness of the part, local or general tonic remedies to build up the reparative power, and stimulating applications to the ulcer, strapping, or incision when there is a tendency to indolence. WILLIAM PEPPER.

Ulema, oo-le-mää' [Arab., wise]: a plural term in Mussulman countries including all persons learned in religious law. Till 1846 the ulema controlled all Mussulman education in Turkey. From them are chosen the cadis, mollahs, and imams. E. A. G.

Ulex: scientific name of FURZE (*q. v.*).

Ulfeldt, LEONORA CHRISTINA: prose-writer; b. at the palace of Frederiksborg, Denmark, July 18, 1621. She was a daughter of Christian IV. and Kirstine Munk, and was married in 1636 to Korfitz Ulfeldt, one of the most powerful of the Danish nobility. On the conviction, in 1663, of her husband of high treason, she fell a victim to the jealousy of the queen, Sophie Amalie, and was confined in the Blue Tower in Copenhagen until the death of the queen in 1685. During her imprisonment she wrote an account of her sufferings, *Jammers Minde* (The Memory of Grief), first published in 1869 by S. Birket Smith, who calls it "the most important Danish prose work of the seventeenth century." D. at Maribo cloister, Mar. 26, 1698. D. K. DODGE.

Ulfilas: See GOTHIC LANGUAGE.

Uliasu'tai, or **Uljassutai**: an important commercial station of Mongolia, in lat. 48° 22′ N., lon. 97° E., on the line between the Russian frontier and Si-ngan-foo, capital of the Chinese province of Shensi, and principal dépôt for all goods destined for the markets of Central Asia (see map of China, ref. 1–F). It consists of a civil and a military quarter, the latter occupied by the Chinese garrison, the former by inhabitants who are partly Chinese and partly Mongolian. The Mongolian nomads who visit the city during the fair live in tents. Revised by M. W. HARRINGTON.

Ullmann, KARL: theologian; b. at Epfenbach, Palatinate, Mar. 15, 1796; studied theology at Heidelberg, Tübingen, and Berlin; lived in friendly intercourse with Hegel and Daub; afterward with Schleiermacher and Neander; was appointed Professor of Theology at Heidelberg in 1821; founded in 1828, together with Umbreit, the *Theologische Studien und Kritiken*, which is still the principal representative of that school of German theology which believes in, and tries to work out, a complete reconciliation between Christianity and the modern culture; went as professor to Halle in 1829, but returned to Heidelberg in 1836; was made president of the chief ecclesiastical council of Baden in 1856, but resigned this office in 1861, and retired into private life. His principal writings are *Gregory of Nazianzus* (Darmstadt, 1825; 2d. ed. 1867; Eng. trans., London, 1851); *Historisch oder mythisch?* (Hamburg, 1838; directed against Strauss); *The Worship of Genius* (Hamburg, 1840; translated into English 1846); *Reformers before the Reformation* (2 vols., 1841; translated into English by Robert Menzies, Edinburgh, 2 vols., 1855); *Apologetic View of the Sinless Character of Jesus* (Jena, 1828; Eng. trans., Edinburgh, 1841; from 7th ed. [1863] 1870); *The Essence of Christianity* (Gotha, 1845; 4th ed. 1854; Eng. trans., London, 1860). See his *Life*, by W. Beyschlag (Gotha, 1866). D. at Carlsruhe, Jan. 12, 1865. Revised by S. M. JACKSON.

Ulloa, ool-yō'ăă, ANTONIO, de: naval officer and scientist; b. at Seville, Spain, Jan. 12, 1716. He early entered the navy, and in 1735 was appointed, with Jorge Juan, to accompany the French scientific expedition to Peru. (See LA CONDAMINE.) During a residence of nine years in that country, Ulloa and Juan made extensive surveys, and studied the history and social condition of the people. A secret report which they sent to the Spanish Government was published in English in 1826. It is of great historical importance, especially in showing many of the abuses which subsequently led to the revolution. Returning to Europe at the end of 1744, Ulloa was captured by a British cruiser, but was soon released. In 1748 he published, with Juan, *Relación histórica del viaje á la América meridional*, which has been translated into various languages, and is widely known. A second work relating to the expedition, *Noticias Americanas*, appeared in 1772. Ulloa became a leader of science in Spain, and founded the first metallurgical laboratory in the country, and the observatory at Cadiz. He was intrusted with several important offices, for which, however, he showed little aptitude. In 1766–68 he was governor of Louisiana. D. near Cadiz, July 3, 1795. H. H. S.

Ulloa, FRANCISCO, de: navigator; b. in Spain about 1485. He was with Cortés in Mexico, and in July, 1539, was placed in command of three vessels which left Acapulco to explore the Gulf of California. One ship was wrecked; with the others he penetrated to the head of the gulf, and, returning, coasted the western side of the peninsula of California, which had been supposed to be an island. The extant accounts of this voyage are confused and somewhat contradictory, but it is certain that Ulloa proved the peninsular form of Lower California. It is stated that he perished in a shipwreck, but another account says that he returned to Acapulco, and was murdered there soon after. H. H. S.

Ulloa y Pereira, -ee-pā-rā'ĕe-răa, LUIS, de: poet; b. at Toro, Leon, Spain, in 1590; was a magistrate, but devoted himself also to literature, producing lyrical poems and several prose treatises. D. 1660. He is sometimes subject to the faults of the school of Gongora. *Rachel*, the best-known of his poems, treats the love-episode of Alfonso VIII. and a beautiful Jewess of Toledo. One of his prose pieces is a discourse in defense of the comedy (1659), at that time assailed by the clergy. See the *Obras de D. Luis de Ulloa: Prosas y Versos* (2d ed. Madrid, 1674). J. D. M. FORD.

Ulm: city; in the kingdom of Würtemberg, Germany; at the influx of the Blau into the Danube, which here becomes navigable (see map of German Empire, ref. 7–E). It is 58 miles S. E. of Stuttgart, is fortified, and is a place of much interest to the tourist, on account of its many fine old buildings. Its cathedral (Protestant), begun in 1377 and carried on till 1494, then left unfinished till 1844, was completed in 1890. It is a magnificent edifice in Gothic style, 455 feet long, 186 feet broad, and 134 feet high, and contains

the largest organ in Germany. The open-work spire is the highest in the world (530 feet). The town has a great variety of manufactures, of which no single branch, however, is extensively developed, although its sweet bread is famous. On Oct. 17, 1805, Gen. Mack, at the head of an Austrian army of 30,000 men, here capitulated to Napoleon. Pop. (1895) 39,304.

Ulma'ceæ: See NETTLEWORTS and ELM.

Ulmic Acid and Ulmin: See HUMUS.

Ulna: See ARM, OSTEOLOGY, and SKELETON.

Ulphilas, or **Ulfilas**: See GOTHIC LANGUAGE.

Ulpia'nus, DOMITIUS: jurist, of Tyrian origin; b. about 170 A. D.; entered public life in Rome under Septimius Severus; obtained the greatest reputation as a jurist, and held various judicial offices under Septimius Severus and Caracalla; lost his influence and his offices under Elagabalus, but came again into power after the accession of Alexander Severus, but incurring the enmity of the pretorian guard, he was murdered by them in 228. Of his writings, which were very numerous and extensive, only fragments exist, but about one-third of the *Digest* of Justinian consists of excerpts from his books. The *Tituli ex Corpore Ulpiani*, generally called *Fragmenta Ulpiani*, was edited by Hugo (1834) and by Böcking (1845).

Revised by G. L. HENDRICKSON.

Ulric, SAINT: bishop; b. at Augsburg about 890: d. July 4, 973. He came of noble parents, and having become a monk was in the line of promotion to the episcopacy, to which he attained in 923. As was customary, he combined worldly pomp with spiritual authority and acts of piety. He stirred up the people to a great fight by which they repelled the Magyars in 955. This caused him to be held in grateful esteem. He dispensed alms lavishly, built churches and monasteries, and did much to beautify Augsburg. He was very devout, and exerted strict discipline over his priests. He was particularly given to the worship of relics, and made long journeys to secure them. He resigned his see shortly before his death and died as a Benedictine monk. His retirement was considered a sin by the Council of Ingelheim (972). He enjoyed repute for holiness while he lived, and his first biographer, Gerhard, does not hesitate to ascribe miraculous power to him. Miraculous cures were wrought on his grave. His successor, on the strength of these statements, claimed that the whole Christian world should honor him. In Feb., 993, Pope John XV. issued a bull laying such an obligation upon Christendom—interesting as the first instance of a papal command raising a local saint into the company of saints of the Roman Catholic Church. Several writings have been falsely attributed to Ulric, particularly a memorable rejoinder to the decree of a certain Pope Nicholas, who sought to enforce sacerdotal celibacy, which the author contends was going beyond Scripture. This was published by Flacius in his *Catalogus testium veritatis, qui ante nostram ætatem reclamarunt Papæ* (Basel, 1556); best by Martene and Durand, *Amplissima collectio*, pp. 449–454, and translated *An epistel of moche learning, sent by saint Huldericus, Bisshoppe of Augusta, called Augsburgh, unto Nicolas, Bysshoppe of Rome, the fyrst of that name: against the unmaried chastitie of pryestes* (London, 1550). But there was no pope of that name in the tenth century. For his biography, see Waitz, edition of Gerhard's biography in *Monumenta: Scriptores IV.*, pp. 377, *seq.* S. M. J.

Ulrich, CHARLES FREDERICK: See the Appendix.

Ulri'ci, HERMANN: philosopher; b. at Pförten, Brandenburg, Mar. 23, 1806; studied law at Halle and Berlin, but devoted himself after 1829 exclusively to the study of philosophy, and was appointed Professor of Philosophy at the University of Halle in 1834. He wrote *Ueber Princip und Methode der Hegelschen Philosophie* (1841); *Grundprincip der Philosophie* (2 vols., 1845–46); *System der Logik* (1852); *Glauben und Wissen* (1858); *Gott und die Natur* (1862); *Gott und der Mensch* (1866; 2d ed. 1874); *Der Philosoph Strauss* (1873; translated by C. P. Krauth, 1874); *Ueber Shakespeare's dramatische Kunst* (1839; 3d ed. 1868; translated into English by A. J. W. Morrison, London, 1846). D. at Halle, Jan. 11, 1884. Revised by J. M. BALDWIN.

Ulster: the northernmost of the four provinces into which Ireland is divided; borders N. and W. on the Atlantic and E. on the North Channel and the Irish Sea; area 8,613 sq. miles. The surface is greatly diversified; the west part is mountainous, some summits being over 2,000 feet high. The province contains the large loughs Neagh, Strangford, and Erne. Pop. (1891) 1,619,814, of whom more than half are Protestants.

Ultramarine [from Lat. *ul'tra ma're*, beyond the sea. So called because originally brought from Asia; cf. Span. *ultramarino*]: a blue pigment formerly obtained from lapis lazuli, a mineral containing silica, alumina, soda, lime, sulphuric acid, a little sulphur and iron, with a very little chlorine and water. It is found in Siberia, Transylvania, Persia, China, Tibet, Tartary, and the East Indies, and furnishes a beautiful and very durable pigment. The analysis of lapis lazuli led to the production of artificial ultramarine, a prize of 6,000 francs being offered in 1824 by the Société d'Encouragement of Paris for this purpose. It was awarded in 1828 to Guimet of Toulouse, who first produced it on a large scale, although Gmelin had shortly before made it by a process essentially the same as that now followed. Wagner (*Chemical Technology*) gives the following classification of the different methods followed: The *sulphate* or *Glauber's salt ultramarine* is prepared by intimately mixing 100 parts of dried kaolin, 83 to 100 parts of calcined Glauber's salt, and 17 of charcoal, or else 100 of kaolin, 41 of Glauber's salt, 41 of calcined soda, 17 of charcoal, and 13 of sulphur, and heating the mixture very strongly for seven to ten hours in fire-clay crucibles. The contents are then repeatedly treated with water, pulverized, washed, dried, ground, and sifted, furnishing *green ultramarine*, ready for the market. (See CHROMIUM.) To convert it into *blue ultramarine* about 4 per cent. of sulphur is mixed with it, the whole roasted at a low temperature, with access of air, and this treatment repeated until the desired blue color is produced. The blue product is pulverized, washed, dried, and separated into different qualities. *Soda ultramarine* is either made with a mixture of soda and sulphate or with soda alone, as in the following mixture: kaolin 100, soda 100, charcoal 12, sulphur 60. The ignition is best performed in a reverberatory furnace, and the conversion into blue ultramarine in a large muffle, with addition of sulphur, the product being finer than the former. By increasing, within certain limits, the quantities of soda and sulphur, blue ultramarine may be at once obtained. *Silica ultramarine* is soda ultramarine prepared with kaolin which has received an addition of 5 to 10 per cent. of silica. It is at once obtained by calcination as blue ultramarine, withstands the action of alum, and has a violet tint.

Ultramarine is decomposed by the mineral acids, even dilute, with evolution of hydrogen sulphide. The natural ultramarine is far more durable, but the artificial is now very extensively employed as a pigment for calico-printing, coloring paper and cotton fabrics, and various other purposes for which smalt was formerly used. It should not be used for coloring candies. Sometimes it is mixed with chalk, kaolin, and barytes to make the tints lighter. *Cobalt ultramarine* is Thénard's blue. (See COBALT.) *Yellow ultramarine* is a name sometimes applied to barium chromate. *Ultramarine ashes* is a pale residue obtained in the preparation of native ultramarine. Ultramarine is largely manufactured in Germany, France, Belgium, and to some extent in England. Its manufacture is an important industry in the U. S., and according to the *Mineral Resources of the United States* for 1893 113,647 tons were produced in that year. Revised by IRA REMSEN.

Ultramon'tanism [from Late Lat. *ultramonta'nus*, ultramontane; *ul'tra*, beyond + *mon'tes*, mountains (i. e. the Alps), viz., generally in relation to France]: in the Roman Catholic Church the principles and tendency of those who desire rather to increase than to minimize the authority and power of the pope. The opposite tendency is known as Gallicanism. Not unfrequently, in the ardor of recent discussions, the genuine teachings of the Catholic Church have been classed as Ultramontanism. JOHN J. KEANE.

Ultra Vi'res [Lat., beyond the powers]: a term applied to the contract of a corporation when it is beyond the powers conferred upon this artificial person by its charter and the general laws applicable thereto. The term is quite modern, having been introduced by Baron Bramwell as counsel in *East Anglian R. Co.* vs. *Eastern Counties R. Co.*, 11 Common Bench 775, in 1851. Since its adoption it has been employed in a variety of senses. It has been applied to authorized acts which the corporation has performed in an unauthorized manner. It has been applied also to acts within the power of the corporation, but not within the authority of the officers or agents who have done them. Still again it has been applied to positively illegal acts of

corporations. The tendency of recent decisions, however, is to limit the term to the signification stated at the opening of this article.

Ultra Vires Contracts.—The general rule is that they are not enforceable. This rests upon three reasons: 1. The interest of the public that the corporation shall not transcend the powers granted. 2. The interest of the stockholders that the capital shall not be subjected to the risk of enterprises not contemplated by the charter, and therefore not authorized by the stockholders in subscribing for the stock. 3. The obligation of every one, entering into a contract with the corporation, to take notice of the legal limits of its powers. (*Railway Cos.* vs. *Keokuk Bridge Co.*, 131 U. S. 371.) So long as an *ultra vires* contract remains executory on both sides, neither party can maintain an action for its enforcement nor for damages for its breach. If it has been executed by one party, its *ultra vires* character is still a defense to the other, provided the latter has not received and retained the benefit of its performance. For example, a savings-bank gives an order to a broker for the purchase and sale of cotton futures. The broker buys, sustains a loss, and sues the bank for his commissions and loss. *Ultra vires* is a good defense. (*Jemison* vs. *Bank*, 122 N. Y. 135.) Had the bank received and retained the cotton, a different question would have been presented. In such a case, according to some authorities, the bank would have been liable on the contract, on the ground of ESTOPPEL (*q. v.*). "The basis upon which the enforcement of the contract in such cases rests is that the company is estopped from setting up its own unauthorized act, and its own incapacity to evade performance on its part after receiving the fruits of the bargain." (*Camden, etc., R. Co.* vs. *Mays Landing R. Co.*, 48 N. J. L. 530, 568.) According to other authorities, the bank would not have been liable on the contract, but would have been subject to a *quasi-contractual* obligation. This seems to be the better view. It was clearly and forcibly stated in *Central Transportation Co.* vs. *Pullman's Car Co.* (139 U. S. 24). "A contract *ultra vires* being unlawful and void, not because it is in itself immoral, but because the corporation by the law of its creation is incapable of making it, the courts, while refusing to maintain any action upon the unlawful contract, have always striven to do justice between the parties . . . In such case, however, the action is not maintained upon the unlawful contract, nor according to its terms, but on an implied contract of the defendant to return, or, failing to do that, to make compensation for property or money which it has no right to retain." See Keener, *Quasi Contracts*, p. 272.

Torts committed by corporations are not within the doctrine of *ultra vires*. The U. S. Supreme Court has declared that it has been found necessary to hold corporations responsible for torts or quasi-criminal acts not strictly within their corporate authority, when done in their corporate name, and by officers competent to exercise corporate powers. (*Salt Lake City* vs. *Hollister*, 118 U. S. 256.) To permit the defense of *ultra vires* in such cases would be equivalent to a license to corporations to indulge in unlimited wrongdoing.

Restraining Ultra Vires Acts.—Suits for this purpose may be brought by stockholders or creditors. In some jurisdictions such suits may be instituted by the State, but in the absence of statutory authority therefor they will not be sustained unless some plain and sufficient public mischief be shown as a warrant for State interference. (*Attorney-General* vs. *Railway*, 11 Chancery Div. 449.) *Ultra vires* acts may be so deliberate and flagrant as to justify a forfeiture of the charter by the State. (*People* vs. *North River Sugar Refining Company*, 121 N. Y. 582.) For a full discussion of this subject, the reader is referred to Green's edition of Brice's *Ultra Vires*. FRANCIS M. BURDICK.

Ulugh (oo'loog) **Beg**: ruler and astronomer; b. in 1394; a grandson of Timur. He succeeded his father on the imperial throne of Persia in 1447, but was put to death in 1449 by his own son. He founded the observatory at Samarkand, encouraged the study of astronomy, was a diligent and accurate observer himself, and wrote several astronomical works in Arabic, which have been translated into Persian: into Latin by Greaves (London, 1650–52) and by Thomas Hyde (Oxford, 1665); into French by L. A. Sédillot (1846–53). An edition of his catalogue of stars appeared in the *Memoirs* of the Royal Astronomical Society, vol. xiii (1843).

Ul'verstone: town; in Lancashire, England; on Morecambe Bay; 8 miles N. E. of Barrow-in-Furness (see map of England, ref. 5–F). It manufactures different kinds of coarse woolen and linen fabrics, and exports considerable quantities of pig iron, bar iron, iron ore, limestone, and slate. Pop. (1891) 9,948.

U'lybuschew, Ulibischew, Ulibischeff, or **Onlibicheff** (*Ulybuschew* is the German mode of spelling the name), ALEXANDER DMITRIWICH, von: Russian musical critic; b. in 1795 in Dresden, where his father was Russian ambassador; descended from a Tartar family; studied at various German universities; served in the Russian army and subsequently entered the ministry of foreign affairs, but resigned his position in 1831 and lived on his estates near Nijnii Novgorod, devoting himself to the study of music. He wrote *Nouvelle Biographie de Mozart* (3 vols., Moscow, 1844) and *Beethoven, ses Critiques et ses Glossateurs* (Leipzig and Paris, 1857), both of which were translated into English. The latter was in reply to Lenz, who had attacked Ulybuschew for depreciating Beethoven. In Russian he wrote a great number of musical essays and criticisms in various periodicals, which exercised a great influence on the development of musical taste in Russia. D. at his residence Jan. 24 (Feb. 5), 1858.

Ulysses, or **Ulixes**: See ODYSSEUS.

Umatil'la River: a stream which rises in the Blue Mountains of Oregon, flows W. and N. W., and empties into the Columbia river at Umatilla, on the boundary between Oregon and Washington; length about 150 miles.

Umba'gog, Lake: a body of water lying chiefly in the town of Errol, Coos co., N. H., but extending into Oxford co., Me., and there connecting with the most southerly of the Rangeley lakes. It is about 9 miles long and from 1 to 2 miles wide. It is in a wild and beautiful region, and owing to its fine trout is a famous resort in summer for fishermen.

Umbel'lifers, or **Umbellif'eræ** [*umbelliferæ* is Mod. Lat.; Lat. *umbel'la*, umbrella + *fer're*, bear, produce; named in allusion to the shape of the *umbels* or clusters of flowers and fruit]: a family of 1,400 species of dicotyledonous herbs, or rarely shrubs, abounding in both hemispheres, chiefly in cool regions. Most have hollow striated stems, and flowers in umbels, but these are not perfectly constant characters. Various as these plants are in aspect, it is difficult to define accurately their generic and specific distinctions. Among its useful plants are the carrot, parsnip, skirret, chervil, fennel, caraway, dill, coriander, anise, parsley, and celery. Some are useful in medicine, many being active poisons—the medicines conium, cicuta, assafœtida, ammoniac, galbanum, etc. Revised by CHARLES E. BESSEY.

Umber [from Fr. *ombre*, short for *terre d'ombre*, transl. of Ital. *terra di ombra*, liter., shadow earth; *terra*, earth + *di*, of + *ombra*, shadow]: a mineral pigment formerly obtained from Umbria in Italy, but at present chiefly imported from the island of Cyprus. Small quantities of umber are found in the U. S., chiefly in Pennsylvania. Its composition is: Silica, 13 per cent.; alumina, 5 per cent.; iron oxide, 48 per cent.; manganese oxide, 20 per cent.; water, 14 per cent.; being essentially a siliceous brown hematite. It forms brown or yellowish-brown masses, possessing a hardness of 1·5 to 2·5 and a specific gravity of 2·2; adheres to the tongue; shines when rubbed, and dissolves to some extent in hot hydrochloric acid, the solution giving the reaction of iron. When gently heated, water is expelled, and a dark-brown pigment termed *raw umber* is formed; at a higher temperature it is completely dehydrated, and converted into a soft red-brown modification known as *burnt umber*. The dark colors of these pigments depend upon the manganese. They are extensively used as oil and water-color pigments, and are often mixed with other colors.

Umber, or **Umbre**: the *Scopus umbretta*, a bird of the heron family, better known as SHADOW-BIRD (*q. v.*).

Umberto I.: Italian form for HUMBERT I. (*q. v.*).

Umbreit, oom'brīt, FRIEDRICH WILHELM KARL: theologian; b. at Sonneborn, Saxe-Gotha, Apr. 11, 1795; studied theology at Göttingen, and in 1820 was appointed Professor of Theology and Philosophy at Heidelberg, where he died Apr. 26, 1860. In connection with Ullmann he founded the *Theologische Studien und Kritiken* (1828); author of *Kommentar über die Sprüche Salomos* (1826), and *Kommentar über die Propheten des alten Testaments* (4 vols., 1841–46).

Umbrella-bird: a name given to certain of the cotingas (*Cotingidæ*) belonging to the genus *Cephalopterus*, because they bear a large, recurved crest which seems to shade the

head like an umbrella. The most familiar species, *Cephalopterus ornatus*, has a long feathered wattle hanging from the lower part of the neck. It is nearly the size of a

The umbrella-bird.

crow and of a blue-black color. It inhabits the forests of Northern and Eastern South America. F. A. L.

Umbrellas and Parasols [*umbrella* is Lat. form of Ital. *ombrella* : Fr. *ombrelle* : Roman. *umbré* < Lat. **umbrella*, dimin. of *umbra*, shade ; *parasols* is from Fr. *parasol* : Ital. *parasole* < Lat. *para're*, prepare (in Romance langs., be ready, ward off) + *sol*, sun] : portable shades or canopies, capable of being folded ; intended as shields against rain or sun. The umbrella is of ancient origin. The Egyptian and Ninevite sculptures, of the earliest dates, have representations of it, but only in connection with royalty. The umbrella was spread like a halo over the head of the monarch, whether in a chariot or in open-air feasts. The Chinese adopted it at an early period of their history, and were the only people who did not confine its use to the king and princes. With them, the man who was privileged to bear an umbrella was one of wealth and high position. The Japanese have used the umbrella ever since they established themselves in their island empire. The use of the umbrella or parasol is universal throughout India, but in Burma and Siam it is a mark of rank. In Burma the umbrellas of the king were of white silk, and no other person was allowed to carry a white one. In some of the Hindu sculptures Vishnu is represented as visiting the infernal regions with an umbrella spread above his head. In Greece the umbrella or parasol was much used by women of rank, and there are allusions to it in the Greek poets. In Rome its use was confined to women and effeminate men who used it as a protection from the sun, and it was made substantially like those of the present. Thence it extended to the countries of Southern Europe and Northern Africa. In the Middle Ages its use among women was less common, but it was an emblem of rank in the Church. All the large churches, especially cathedral churches, owned an umbrella to be used in processions. The umbrella was introduced into England as early as the fourteenth century. The parasol came into use in France and England, probably from China, about the middle of the seventeenth century. The forms and the material indicate its Chinese origin, though it was used in Italy nearly seventy-five years earlier. In England it was carried by women as a protection from both the rain and the sun as early as 1700. Jonas Hanway, an eccentric traveler and philanthropist, is believed to have been the first man of note who carried one in the streets, and he encountered much ridicule for doing so. The umbrella in use at this time was made of oiled muslin or silk, sometimes of a tough oiled paper, and rarely, as in Hanway's case, of silk. It was generally very heavy. Improvements in its construction have made it light and graceful, and it is now universally used. Besides its hand-service, it is used for express-wagons, omnibuses, and carriages, where it takes the place of the leather carriage-top. Modifications of it are the parachute and the umbrella-tent.

The umbrella, in the general construction of its frame, has changed but little in thousands of years, though the materials used have been improved. Chinese frames, which have been largely the models of others, were made of bamboo and light but strong woods. In Europe the ribs were at first made of rattan or split bamboo, then of wood, usually white oak, afterward of whalebone. They are now made of the best steel (and often grooved) in the finer classes of goods, and of rattan in the cheaper. In the finest umbrellas the covering is of silk or of silk and cotton, while for the cheapest cotton alone is used. Waterproof materials, such as rubber, are also sometimes used. The paragon frame, in which the ribs and stretchers are grooved, has been improved by a slight bending inward of the ribs, so that when closed they fit compactly round the stick. Parasols are made like umbrellas, though occasionally lined, trimmed, or covered with lace, etc. The English market is the chief one for umbrellas, single manufacturers making millions of them in a year. Umbrellas have been made in the U. S. since 1802, and in considerable numbers since 1812, but except for the cheapest goods, the sticks, the ribs, the stretchers, and the coverings were imported. A large part of the silk, the steel ribs, and a large proportion of the sticks are still (1895) imported, though paying a heavy duty.* The census of 1890 reported that there were in the U. S. that year 435 establishments for the manufacture of umbrellas and canes, employing 6,863 persons, paying wages during that year amounting to $3,204,797, and producing $13,771,927 worth of goods. During the fiscal year of 1894 umbrellas, parasols, and sunshades (together with sticks for the same) valued at $86,305·75 were imported into the U. S. See *L'Ombrelle, le Gant, le Manchon*, by Octave Uzanne (Paris, 1882).

Revised by MARCUS BENJAMIN.

Umbrella-shell [so called from its shape] : any gasteropod mollusc of the genus *Umbrella* (family *Pleurobranchidæ*), which contains only three known living and two extinct species. The small, flattened umbrella-shaped shell covers only the more important organs, and the shell itself is often concealed by the mantle.

Umbrella-tree : a small tree of the magnolia family (*Magnolia tripetala*), found in the U. S. along the Alleghany Mountains from Pennsylvania to Kentucky. It has obovate-lanceolate leaves, pointed at both ends, and a rose-colored fruit. It takes its name from the fact of the leaves being crowded on the summit of the flowering branches in an umbrella-like circle. Revised by CHARLES E. BESSEY.

Um'bria : an ancient division of Italy, extending along the east side of the upper Tiber, and embracing the valleys formed by the smaller watercourses of the Apennines E. to Adriatic. In classical times the Tiber formed the western boundary between Umbria and Etruria, while the eastern border extended along the Adriatic from the Rubicon to the Æsis. The region contained no important towns, but was inhabited by a population devoted to agriculture and grazing, living in small hamlets. The inhabitants were related in race and language to the Sabine and Latin peoples to the south and west. For an account of their language and its relations, see ITALIC LANGUAGES. G. L. HENDRICKSON.

Um'bridæ [Mod. Lat., named from *Um'bra*, the typical genus, from Lat. *um'bra*, a kind of fish, liter., shadow] : a family of haplomous fishes, represented in North America and Eastern Europe. In form they resemble the "killie-fishes" or "minnows" (*Cyprinodontidæ*) : the body is covered with moderately large scales ; the lateral line is obsolete ; the head is conic in profile, and covered with moderate scales like those on the body ; the eyes are lateral ; the opercular normal and unarmed ; the mouth is moderate and has a lateral oblique cleft ; the upper jaw is formed by the intermaxillaries as well as supramaxillaries ; teeth are present on the jaws and palate ; branchiostegal rays five or six ; the dorsal fin has articulated and branched rays, and is above the ventrals ; the anal is smaller and farther back than the dorsal ; the ventrals abdominal and with six rays. The intestinal canal has a simple stomach and no pyloric cæca ; the air-bladder is simple. The species of the family are from 3 to 5 inches long, and live in fresh and brackish water ponds and the waters in the eastern parts of Europe and many portions of the U. S. The European species is *Umbra crameri* ; the American are *Umbra limi* and *Dallia pectoralis*. The American species live, it may be said, in the mud, and patches of water which appear destitute of fishes may yield considerable numbers of this kind by being dragged and the bottom stirred up. Revised by F. A. LUCAS.

Umlaut, oom'lowt, or **Mutation** [*umlaut* is Germ., modification or reconstruction of a sound; cf. *umkleiden*, dress anew, *umarbeiten*, retouch, make over, etc.]: a technical term of Teutonic historical grammar denoting in its strictest application the influence exercised upon an accented syllable by the vowel *i* or its consonant *j* (*i̯*) in a following syllable. The application of the term has been extended to the parallel, though less common, phenomena, resulting from the influence of other vowels than *i*, so that it is possible to speak, e. g., of *i*-umlaut, *o*-umlaut, *u*-umlaut; but in its proper and original significance, and when left unqualified, the term applies to *i*-umlaut. The phenomena of *i*-umlaut belong to the separate life of the different Teutonic languages, and the laws of their occurrence must be stated separately for each branch, e. g. for O. Eng., for O. H. Germ. or M. H. Germ., for O. Norse, etc. In O. Eng. the action of these laws was in the main complete by the beginning of the eighth century A. D., having begun in the sixth. Their chief results are the following: (1) *a*(*æ*) > *e*, *settan* : Goth. *satjan*; (2) *ā* > *ē*, *hāl* : Goth. *hails* versus *hēlan* < **hālain* : Goth. *hailjan*; cf. Eng. *whole* versus *heal*—so Eng. *one* versus *any*, *lode* versus *lead*; (3) *o* > *y*, *gold* versus *gylden* < **goldīn*, cf. Eng. *gild*, also *fox* versus *fixen*, *vixen*; *fore* versus *first*; *foal* versus *filly*; *born* versus *birth*; (4) *ō* > *ē*, *dōm*, judgment, versus *dēman*, to judge: Goth. *dōmjan*; cf. Eng. *doom* versus *deem*—also *goose* versus *geese*, *foot* versus *feet*, *tooth* versus *teeth*, *food* versus *feed* (Goth. *fōdjan*), *book* versus *beech*, *blood* versus *bleed*, etc.; (5) *u* > *y*, *full* versus *fyllan* < **fullian* : Goth. *fulljan*; cf. Eng. *inch*, from Lat. *uncia*; *dung* versus *dingy*, *stunt* versus *stint*, *won* versus *winsome*; (6) *ū* > *ȳ*, *cū*, cow versus *cȳ*, kine; cf. Eng. *mouse* versus *mice*, *louse* versus *lice*; (7) *ea* > *y* (*ie*, *i*), *eald*, old versus *ieldra*, elder; cf. Eng. *old* versus *elder*; (8) *ēa* > *ȳ* (*īe*), *cēap* versus *cȳpan* (*cēpan*); cf. Eng. *cheap* versus *keep*; (9) *eo*, *ēo* > *y*, *ȳ* (*ie*, *īe*), *weorc*, work versus *wiercan*, to work. Similar results of umlaut in German are *gast* versus *gäste*, *lamm* versus *lämmer*, *kraut* versus *kräuter*, *trost* versus *trösten*, etc. The phenomena of umlaut do not differ in their essential character from the various forms of assimilation between syllables, which appear in other languages and elsewhere in Teutonic, receiving various names, as epenthesis, fracture (*brechung*), vowel-assimilation, vowel-harmony, etc. See ABLAUT. BENJ. IDE WHEELER.

Umnak, oom-naa*kh*': one of the Aleutian islands, Alaska, the westernmost of the Fox islands group; in about lat. 53° N., lon. 168° 30′ W.; 65 miles long and 10 miles broad at its broadest part; lying N. E. and S. W., and separated from Unalashka by the narrow Umnak Pass (5 miles wide). It is mountainous and bare, and the climate, though mild, is too cool for ordinary crops, except potatoes. The population is Aleut, very small, and mostly centered in the little village of Nikolski, of less than 300 inhabitants, on the west coast. The chief industries are fishing and sealing. The island has a ridge of mountains along its axis, culminating with the volcano of Vsevidoff, said to be 8,000 feet high, and which, though not active, occasionally smokes. Other volcanic peaks of the island are sometimes active, and in 1817 one of the northern peaks emitted such clouds of ashes as to cover the island several inches thick. The small volcanic island of Bogosloff, which appeared in 1796, is just N. and connected with Umnak by a reef. Many hot springs are known to exist on the island. In a small valley inland there are several, all boiling; one is said to rise and fall a distance of 2 feet four times an hour. Near Deep Bay, at the northeastern end, are several with temperatures ranging from lukewarm to boiling. Lignite, fossil-wood, and fire-clay have been noted on Umnak. The first recorded visit to the island was that of a Russian skipper named Nikiforoff in 1757. MARK W. HARRINGTON.

Umritsir: another spelling of AMRITSIR (*q. v.*).

Unadil'la: village; Otsego co., N. Y.; on the Susquehanna river, and the Del. and Hudson Railroad; 44 miles E. of Binghamton, and 95 miles S. W. of Albany (for location, see map of New York, ref. 5–H). It has a milk-condensing establishment, foundry, machine-shop, wagon-factory, four churches, high school, academy, a private bank, and a weekly newspaper. Pop. (1880) 922; (1890) 1,157; (1900) 1,172. EDITOR OF "TIMES."

Unalashka, oon-aä-lăsh'kaä: an Alaskan island, middle one of the Fox islands, and second largest of the Aleutian chain; lying between the parallels 53° and 54° N. and the meridians 166° and 168° W.; about 75 miles long, 25 broad in its broadest part, mallet-shaped, mountainous, bare, and treeless. The great Captain's Bay at the northern end is a common naval rendezvous. Population small, aggregated in a few small villages, of which by far the largest is Unalashka town (native *Iliuliuk*), near the head of Captain's Bay, and containing 428 inhabitants in 1900, mostly Aleuts, a few Russians and Americans. The only industries are fishing and sealing. The climate, though moderate, is too cool for the ordinary crops, except potatoes. The thermometer very rarely falls below zero at Iliuliuk, and very rarely passes 80° in summer. The grasses are very juicy and luxuriant. The mountains are volcanic, and Makushin, in the northwestern part of the island, 5,961 feet high, constantly smokes, and is occasionally in active eruption. Earthquakes in its vicinity are not rare. Metallic copper has been reported from Unalashka. The land fauna is poor in species and numbers. The black and silver foxes of the island, formerly much prized, are exterminated. Unalashka is one of the most important points in Alaska. Cave explorations show that the early inhabitants had developed a relatively considerable art, and tradition attributes to them unusual skill in whaling. Soloiroff and Glottoff, Russian adventurers, wintered there with a party in 1765–66, and then began a series of cruelties on the Aleuts which soon reduced them to a condition of helpless subserviency to Russian masters. In 1824 the cloud was lifted in part by the appearance of Father Veniaminoff, a noble and devoted missionary, the apostle of the Aleuts, who devoted himself to their well-being and education. Unalashka has been often visited by explorers and whalers, was long an administrative center, and is, after the Pribilof islands, the most important place W. of Kadiak. MARK W. HARRINGTON.

Unau: the two-toed South American SLOTH (*q. v.*).

Uncas: an Indian sachem; b. in the Pequod settlement, Connecticut, about 1600. Originally a war-chief of the Pequods, he revolted against Sassacus, the sachem, in 1634; made friends with the whites, and became chief of the Mohegans. In 1637 he joined Mason's expedition against the Pequods, and was rewarded with some of their lands; made several treaties with the settlers in Massachussets and Connecticut, and in 1643 joined them in a war against Miantonomo, the Narragansett sachem. In 1657 he was besieged in his stronghold on Connecticut river by the Narragansetts, but when on the point of starvation was relieved by Ensign Thomas Leffingwell, to whom it is said that he granted the land upon which Norwich now stands, although he subsequently sold it to others. Many complaints were made against him by other Indians, and in 1654 he was warned by the commissioners of the united colonies that he would not be protected in any unlawful, treacherous, or outrageous course. He was always on good terms with the whites. D. in 1683. See Stone, *Uncas and Miantonomo* (New York, 1842).

Uncial Letters [transl. of Late Lat. *lit'teræ uncia'les*, liter., inch letters, i. e. letters of considerable size; *uncial* is from Late Lat. *uncia'lis*, liter., of or pertaining to an inch, deriv. of *un'cia*, a twelfth part, ounce, inch]: a name used in palæography for the rounder characters which took the place of capitals in the manuscripts of the early Middle Ages. The angular capitals of the inscriptions could not be written with ease and speed on papyrus or parchment; and already in the first century A. D., in the Herculanensian rolls and the wall-scratches and waxed tablets of Pompeii, the germs of a rounder script may be seen. By the fourth century this style was fully developed, and till the eighth the uncial was the prevailing hand of books. The letters which especially show the change are *a*, *d*, *e*, *h*, *m* (which then took on the forms so familiar in our small letters), and, in less degree, *g*, *q*, *t*, *u*. The name *uncial* is borrowed from St. Jerome, who censures the luxury of books written "*uncialibus ut vulgo aiunt litteris*"; though there is every reason to believe that he meant large letters in general. A style of writing, common from the fifth century, in which forms derived from the cursive hand of documents are mixed with uncials, is often known as half-uncial or semi-uncial.

The development of Greek handwriting was similar to that of Latin; and the name *uncial*, borrowed from Latin palæography, is applied also to the rounded Greek capitals which, appearing as early as the third century B. C., remained the current book-hand till the ninth century A. D. For specimens of Greek uncials, see under CODEX ALEXANDRINUS. GEORGE L. BURR.

Unconscious States: states of mind considered as still mental when they are not present in consciousness or thought, as, for example, our memories when we have no occasion to

call them consciously to mind. The psychologists have found it a difficult question to decide whether such supposed modifications of mind have any right to be called mental at all when there is no trace of their actual presence in consciousness. The school of Herbart—a great German psychologist and philosopher—hold that nothing that the mind has once experienced can ever be entirely lost to it; but each such experience preserves its identity as a presentation or mental picture, although it becomes unconscious. The memory then of a thing or event once experienced is its literal recall from the sphere of the unconscious where it has been lying since its last appearance in consciousness. To this view the name "pigeon-hole theory" has been given, especially to the view that memories are stored away somewhere in the soul, of which the Herbartian theory is a refinement. In opposition to it many psychologists hold what is known as the "functional" theory, according to which the memories which at any time we are not thinking about at all, those which are not in consciousness however dimly, simply do not exist. The reappearance of a memory in consciousness is a new exhibition of the function involved in its original appearance. It is a new creation. It has not persisted since its earlier appearance. The only thing that has persisted is a tendency to have the same functional reinstatement again; and this tendency may be largely accounted for as an easier—because more habitual—stirring up of the brain processes which occur with this particular memory. Many striking facts have been discovered showing what the mind may do in apparent unconsciousness; but they seem all to be capable of explanation on the functional theory. See the *Psychologies* cited in the article PSYCHOLOGY, especially the works of James, Brentano, and Baldwin.

J. MARK BALDWIN.

Unction, Extreme: See EXTREME UNCTION.

Underground Railways: railway lines built below the level of the streets of a city, partly in tunnels. The underground railways of London were begun in 1860, and in 1884 the inner circle, connecting the principal railway termini on the north side of the Thames, was completed; this is 13 miles long, with four tracks and twenty-seven stations. The Metropolitan District Railway forms an outer circle, with extensions leading to the suburbs. In these railways the cost of construction was extremely high, owing largely to the difficulties of tunneling and excavating without disturbing the foundations of buildings; it ranged from $1,800,000 to $2,500,000 per mile. The number of passengers carried on the inner circle is about 90,000,000 per year. The motive power is mainly steam, the exhaust steam and smoke being condensed in water-tanks during the passage through the tunnels. The City and South London line, opened in 1890, uses a system of electric traction.

An underground belt-line in Baltimore, 7 miles long, was completed in 1892; it has four tunnels, the principal one being 8,350 feet in length. This was built to enable the Baltimore and Ohio Railroad to reach the central part of the city. Its cost was about $1,000,000 per mile. Boston has a subway, in part four-track and in part two-track, that carries the electric street-car traffic through portions of the heart of the city. It was built in 1897–99 at a cost of $4,400,000. In Jan., 1900, the New York Rapid Transit Commission let the contract for an extensive underground system, and on Mar. 24 the work was formally begun. The route selected embraces a line extending the entire length of Manhattan Island, from the Post Office to Kingsbridge, and another leaving the main line at 104th Street and Broadway and extending northeastward into the Bronx district as far as Bronx Park. The contract price is $35,000,000, the contractor agreeing to build, equip, and operate the road for fifty years. The estimated time for completion is four years, the total length of track being about 21 miles. The plan also provides for an extension under the East river to Fulton Street, Brooklyn, at an additional cost of $8,000,000. See TUNNELS AND TUNNELING.

Underhill, JOHN: colonist; b. in Warwickshire, England, 1597; went to America with Winthrop in 1630; was a representative in the general court from Boston, and in 1637 was associated with Capt. Mason in command of the colony troops in the Pequod war. Banished from Boston on account of his religious opinions, he went to England, where in 1638 he published an account of the Pequod war in a work entitled *Newes from America*. Returning to America, he was in 1641 governor of Exeter and Dover (N. H.); removed to Stamford, Conn., and in 1646 to Flushing, L. I., and held a command in the war between the Dutch and the Indians. In 1665 he was a delegate from Oyster Bay to the assembly at Hempstead, and in 1667 the Mantinecoc Indians gave him a tract of 150 acres of land on Long Island, which is still held by his descendants. D. at Oyster Bay, L. I., 1672.

Revised by F. M. COLBY.

Under-lease: See LANDLORD AND TENANT.

Understanding: the mental function of knowledge or intellect as contrasted with feeling and will. (See KNOWLEDGE.) The use of the word in this more general sense, which is in near accord with the popular use of it, is in contrast to its earlier philosophical meaning. The older view of the understanding considered it a higher faculty for the apprehension of the ideas. It was thus a kind of higher endowment for taking in abstract *a priori* truths, such as the ideas of God, immortality, freedom, etc., which come as a kind of revelation to this faculty without the admixture of error, the tentative formulations, etc., which necessarily belong to all the knowledge which rests upon experience. The current meaning given to the word in psychology is based upon the denial of the existence of any special human faculty for the apprehension of the abstract or universal. According to it all mental activity is alike in its nature and function. Abstract notions are due simply to the further exercise of the same function that gives the perception of concrete things. All knowledge is both abstract and concrete, both singular and universal; and all knowledge is dependent upon experience in exactly the same sense. So the word knowledge when properly defined covers the whole case; and other words, such as understanding, if used at all, simply become alternative or synonymous terms. J. M. B.

Underwood, LUCIEN MARCUS, Ph. D.: botanist; b. at New Woodstock, N. Y., Oct. 26, 1853; educated at Cazenovia Seminary and Syracuse University; Professor of Geology and Botany in Illinois Wesleyan University 1880–83; Professor of Biology in Syracuse University 1883–91; became Professor of Botany in De Pauw University 1891. He has published *Our Native Ferns and How to Study Them* (1881), revised as *Our Native Ferns and their Allies* (1882; 4th ed. 1893); *Descriptive Catalogue of North American Hepaticæ* (1884); *Hepaticæ* in the sixth edition of *Gray's Manual of Botany* (1890); besides many papers on similar subjects in the botanical journals. He prepared *An Illustrative Century of Fungi*, 100 specimens (1889), and *Hepaticæ Americanæ*, 160 specimens (1887–93). C. E. B.

Underwriter and Underwriting: See MARINE INSURANCE.

Undulation: See WAVES, ACOUSTICS, and LIGHT.

Undulatory Theory of Light: See LIGHT.

Unger, FRANZ: botanist; b. near Leutschach, Styria, Nov. 30, 1800; studied medicine at Prague and Vienna; practiced as a physician, but in 1836 was appointed Professor of Botany and director of the botanical garden at Gratz; removed in 1850 to Vienna; undertook extensive scientific journeys in Denmark, Sweden, and Norway, subsequently in Egypt and Syria. His principal works are *Anatomie und Physiologie der Pflanzen* (1855); *Versuch einer Geschichte der Pflanzenwelt* (1852); *Botanische Streifzüge auf dem Gebiete der Kulturgeschichte* (1857); *Genera et Species Plantarum Fossilium* (1850); *Iconographia Plantarum Fossilium* (1852); *Sylloge Plantarum Fossilium* (1860); *Die Fossile Flora von Sotzka* (1850); *Die Fossile Flora von Kumi in Eubœa* (1867). D. near Gratz, Feb. 13, 1870.

Revised by CHARLES E. BESSEY.

Unger, JOSEPH: statesman and jurist; b. in Vienna, Austria, July 2, 1828; studied law in Vienna 1846–50; held a position in the university library at Vienna 1850–53; taught as privat docent in 1853, in which year he was made Professor of Jurisprudence in the university at Prague, and in 1857 he was installed as Professor of Jurisprudence in the University of Vienna. Here he entered in the discussion of the political questions of the day, and in connection with the revival of the constitutional *régime* in Austria he published *Zur Lösung der ungarischen Frage*, in which he espoused the cause of the liberals. He was successively a member of the Landtag, Reichsrath, and cabinet, but retired from the cabinet in Feb., 1879, upon the reorganization of the ministry. In 1881 he was made president of the Supreme Court. As a jurist he has been most celebrated for his work in systematizing the laws of Austria, and his greatest works are *System des österreichischen allgemeinen Privatrechts* (Leipzig, 1856–59) and *Das österreichische Erbrecht* (Leipzig, 1864). Besides these he has written many other works, including *Die recht-*

liche Natur der Inhaberpapiere (Leipzig, 1857); *Revidierter Entwurf eines bürgerlichen Gesetzbuchs für das Königreich Sachsen* (Leipzig, 1861); and (with Joseph Glaser) *Sammlung von civilrechtlichen Entscheidungen des obersten Gerichtshofs in Wien* (Vienna, 1859–85). F. STURGES ALLEN.

Un'gula [Mod. Lat., from Lat. *un'gula*, dimin. of *unguis*, nail, claw, talon, hoof. So called from its being like a horse's hoof in shape]: a segment of a volume. An ungula of a cone or cylinder is a portion of the cone or cylinder included between the base and an oblique plane intersecting the base. A spherical ungula is a portion of a sphere bounded by two semicircles meeting in a common diameter.

Ungula'ta [Mod. Lat., from Lat. *un'gula*, hoof]: a name applied in various senses to placental mammals having digits terminated by hoofs.

I. By Linnæus the name was employed for all the hoofed mammals in contradistinction to the clawed and mutilate (finned) mammals. These, again, were differentiated into two orders—(1) *Pecora*, including all the ruminating forms, and (2) *Bellua*, embracing the equine and hippopotamine forms: *Rhinoceros* was referred to the *Glires* (rodents), and *Elephas* to the *Bruta* (chiefly edentates).

II. The errors of Linnæus in his references of the genera *Rhinoceros* and *Elephas* were corrected by his successors, and all the true ungulate mammals were combined under the name *Ungulata* or hoofed quadrupeds.

III. By Cuvier (1817, etc.) the ungulate mammals were differentiated into two orders—(1) "les Pachydermes," equivalent to the *Bellua* of Linnæus after the inclusion of *Rhinoceros* and *Elephas*, and (2) "les Ruminants," identical with the *Pecora* of Linnæus. This classification for a long time prevailed, and was the one found in most of the popular works on natural history still longer.

IV. By de Blainville (in 1816) the group, under the name "les Unguligrades," was restricted to the ordinary hoofed quadrupeds, the elephants being isolated as the representatives of a distinct order named "les Gravigrades." The Unguligrades were in turn differentiated into two groups—(1) those with unpaired digits, embracing the normal pachyderms and equines, and (2) those with paired digits, including the suilline forms as well as the ruminants. The manatee was added, erroneously, as an anomalous form of the order. These modifications, except the last, constituted a very decided advance in classification. They, however, attracted but little attention till Owen (in 1840, etc.) revived the same views, and adopted the groups in question under other names. Accepting the division of ungulates as a natural whole, he divided it into three subordinate ones—(1) *Isodactyle* or *Artiodactyla*, answering to the paired-toed Unguligrades of de Blainville; (2) *Anisodactyle* or *Perissodactyla*, equivalent to the odd-toed Unguligrades of de Blainville; and (3) *Proboscidea*, identical with the Gravigrades of de Blainville. These three divisions were finally raised to ordinal rank by Owen.

V. By Huxley and later writers the living ungulate mammals have been mostly distinguished into three orders, characterized by placental as well as skeletal features. (1) The name Ungulata has been reserved for the bulk of the species, which have again been divided into the sub-orders *Perissodactyla* and *Artiodactyla*; (2) the term *Hyracoidea* has been introduced as an ordinal term by Huxley to cover a form (*Hyrax*) which had been confounded with the perissodactyle ungulates and approximated to the *Rhinoceros* by Cuvier and others; (3) the group *Proboscidea* has been accepted as another order.

VI. In addition to the recent forms of ungulate mammals, there are several extinct types which are also by some authors regarded as the representatives of other orders; such are the *Toxodontia* of South America, the *Dinocerata* of North America, etc.

The order *Ungulata*, in the sense now generally used, is characterized as follows: The teeth are, archetypically, in full number (44), but often a number are suppressed; the molars have generally grinding surfaces, and are two- or three-rooted; the canines are very diversiform, generally rudimentary or wanting, sometimes (as in *Tragulidæ*, *Suidæ*, etc.) extremely developed; the incisors are, typically, six in each jaw, but often wanting entirely in the upper, and are implanted by simple roots and have incisorial crowns; the legs at their proximal joints (humerus and femur) are more or less inclosed in the common abdominal integument (least in the camels); the feet are upraised, and their palmar and plantar surfaces are invested in a hairy skin undistinguishable from the rest of the integument; the carpal bones are in two interlocking rows; the cuneiform narrow, and affording a diminished surface of attachment forward for the ulna (which is retrorse beside the radius); the unciform and lunar articulating with each other, and interposed between the cuneiform and magnum; the hind foot has the astragalus at its anterior portion scarcely deflected inward, and articulating more or less with the cuboid as well as navicular; the scaphoid and lunar are separate; the toes of all the feet are never more than four in number, and the terminal joints are invested in thick nails or "hoofs"; the brain is well developed, and the cerebrum covers more or less of the olfactory lobes and cerebellum; the placenta is non-deciduate; the rectal and generative apertures are well separated; the testes more or less exposed. The order thus defined embraces about 250 living species. The existing forms are grouped under two sub-orders and fourteen families, viz.: (I.) *Artiodactyla*, with the families (1) *Camelidæ*, (2) *Giraffidæ*, (3) *Saigiidæ*, (4) *Bovidæ*, (5) *Antilocapridæ*, (6) *Cervidæ*, (7) *Tragulidæ*, all of which are ruminants, and (8) *Phacochœridæ*, (9) *Suidæ*, (10) *Dicotylidæ*, and (11) *Hippopotamidæ*, which are non-ruminants; and (II.) *Perissodactyla*, with the families (12) *Equidæ*, (13) *Rhinocerotidæ*, and (14) *Tapiridæ*. Of these, the second, third, seventh, eighth, ninth, eleventh, twelfth, and thirteenth are now peculiar to the Old World, and the fifth and tenth to the New World; but in ancient times the case was very different, the *Rhinocerotidæ* and *Equidæ* having abounded in North America in the Miocene epoch. A large number of extinct forms are now known which connect together types that are at present far removed. Among the most notable are the *Anoplotheriidæ*, *Oreodontidæ*, and *Hyopotamidæ*, which bridged the existing chasm between the ruminant and non-ruminant ungulates. These had fully developed upper incisors, combined with the characteristic double lunate-ridged molar teeth of the living ruminants, and thus on the one hand were related to the typical ruminants, and especially the *Tragulidæ*, and on the other to the omnivorous artiodactyles, and perhaps most to the peccaries. Also to be noticed in this connection are *Orohippidæ* and *Anchitheriidæ*, as well as *Hipparion*, which form a series with the *Palæotheriidæ*, and demonstrate the relation between the *Rhinocerotidæ* and *Equidæ* of the present epoch. The order was represented by typical examples as early as the beginning of the Eocene period, and undoubtedly very long before, although no remains of an earlier date have been yet discovered. Over twenty families, now entirely extinct, are known from their fossil remains. The order has therefore played a very important part in the earth's past history, and the extinct types already known outnumber the recent. Why certain of the forms formerly existent in America, but later confined to Africa and Asia, became extinct in the former, can scarcely be surmised, as when reintroduced (as have been the horse and hog) they multiply and flourish as much as in their native lands. The order is also noteworthy as furnishing by far the largest portion of the meat-food which man uses, as also the beasts of burden which he employs. Almost all the species—and, above all, the ruminants—are hunted or kept for the meat they yield, and even the perissodactyles—horse, rhinoceros, and especially tapir—are esteemed as food by some peoples. Beasts of draught and labor are obtained chiefly from the *Equidæ* (horse and ass, etc.), the *Bovidæ* (ox, buffalo, etc.), and *Cervidæ* (reindeer). Their contributions in other ways are manifold; the most noteworthy are milk, hides, glue, etc. See the names of the different sub-orders and families, as well as the domesticated animals, and especially the article HORSE. Revised by F. A. LUCAS.

Uniaxial Mica: See BIOTITE.

Unicorn [Lat. *ūnus*, one + *cornu*, horn]: described by various writers, from Ctesias, Aristotle, and Pliny down, as a horse-like creature with a straight horn in the middle of the forehead. Its figure occurs as a heraldic charge. The word *reem* in the Hebrew Bible, translated "unicorn" in the English version, denotes some horned creature, perhaps the buffalo.

Uniformity of Nature: the principle that there are no breaks in the operation of natural law. The principle has two great applications: (1) It underlies the formulation of all the so-called laws of nature, since the possibility of arguing from one or more observed facts in nature to other facts of the same kind which are not observed must rest upon the presumption that the sequences of events in nature are stable and regular. If a certain combination of

chemical elements takes place to-day under certain conditions, the chemist expects the same combination to take place under the same conditions to-morrow. And it does. So, on the basis of this uniformity, he announces the discovery as a fact which any other chemist can confirm. (2) The second application of the principle is made in philosophy. It consists in the demand that uniformity shall be given due criticism, and its meaning in the world as a whole made out. This demand has led to various views, i. e. that uniformity is itself a hypothesis respecting nature, resting upon the experience that nature repeats her events; again, that uniformity is an inborn regulative principle of the human mind. The construing of uniformity, however, has been largely confined to external nature, mind and its events being held to present in free will a phenomenon which violates it. As to the merits of this position, see WILL. The rise of the evolution hypothesis has broken this tradition; the mind is treated as a natural thing and the science of its movements as involving the presuppositions of the natural sciences. J. MARK BALDWIN.

Unigen'itus Bull [so called from its first word being Lat. *unige'nitus*, only begotten]: a bull issued in 1713 by Pope Innocent VI. against 101 propositions contained in the *Réflexions morales* of Pasquier Quesnel (1634–1719). This book had been proscribed by the pope in 1708, but the parliament objected to the prohibition of French books by any other authority than their own. But the king and the great majority of the French bishops were anxious for the pope to pronounce sentence on the subject. Of the 101 propositions condemned by the bull 43 concern grace, 28 treat of the theological virtues, and 30 deal with the Church, her discipline and sacraments. One of the propositions was condemned for holding that all love, except the supernatural love of God, is evil; another, that every prayer made by a sinner is sinful; another, that sinners should not hear Mass at all. No note was assigned to each proposition. Some are evidently not heretical, while others, if examined apart from the spirit which prompted them and the context in which they are found, are capable of a good sense. They have notes affixed only *in globo*, some as heretical, some as ill sounding, scandalous, etc. See A. Schill, *Die Constitution Unigenitus* (Freiburg im Breisgau, 1876). J. J. K.

Unimak, oon-i-maa*k*h': the easternmost and largest of the Aleutian islands; lying between 54° and 55° N. lat. and 164° and 165° W. lon.; nearly rectangular; about 50 miles long by 20 broad; separated from the Peninsula of Alaska by an impassable strait or lagoon called Isanotski or False Pass, which is said to be shoaling. The island is mountainous, rocky, treeless, and is less known and visited than the other large islands. Population, Aleut, very sparse; climate mild, but not favorable to ordinary crops because of the cool summer. Volcanic phenomena are very common, and Shishaldin, the best-known volcano, 8,955 feet high, is generally smoking and often emits flames. Sulphur is found in crevices on Shishaldin, and is reported in large fields near Progrumnoi village, at the western angle. MARK W. HARRINGTON.

Uninhabited Islands: See BONIN ISLANDS.

Union: town; Knox co., Me.; on the George's Valley Railroad: 13 miles N. W. of Rockland (for location, see map of Maine, ref. 9–D). It was settled in 1774 as Taylor Town, organized as the plantation of Sterlington in 1786, and incorporated under its present name the same year, and had part of its territory set off as the town of Washington in 1811. It contains the villages of Union, North Union, South Union, and East Union; has 2 churches, high school, 2 libraries, a weekly newspaper, and manufactories of carriages, furniture, organs, mowing-machines, and stoves; and is in an agricultural region. Pop. (1880) 1,548; (1890) 1,436; (1900) 1,248.

Union Christian College: a coeducational institution at Merom, Ind., founded in 1859 by the denomination called Christians. It has a good working endowment, commodious buildings, and beautiful grounds. It offers thorough instruction in the classics, sciences, the Bible, pedagogy, music, business, and fine arts. The enrollment is steadily increasing from year to year. President, Rev. L. J. Aldrich, D. D.

Union City: city; Randolph co., Ind.; on the Cleve., Cin., Chi. and St. L. and the Pitts., Cin., Chi. and St. L. railways; 30 miles W. by N. of Piqua, and 84 miles N. E. of Indianapolis (for location, see map of Indiana, ref. 5–G). It is in a region abounding in walnut, oak, ash, hickory, and other valuable woods; and has a public high school, 2 State banks with combined capital of $180,000, a daily and 2 weekly newspapers, improved water-works, and several flour-mills and other manufactories. Pop. (1880) 2,478; (1890) 2,681; (1900) 2,716.

Union City: village; Branch co., Mich.; on the St. Joseph river, and the Mich. Cent. Railroad; 11 miles N. W. of Coldwater, and 41 miles W. S. W. of Jackson (for location, see map of Michigan, ref. 8–I). It is the trade-center of a large agricultural region, and has a variety of manufactories; there are 2 national banks, capital $100,000, and 2 weekly newspapers. Pop. (1880) 1,280; (1890) 1,156; (1900) 1,514.

Union City: borough; Erie co., Pa.; on the Erie, the Penn., and the W. N. Y. and Penn. railways; 26 miles S. E. of Erie (for location, see map of Pennsylvania, ref. 1–A). It is in an agricultural region; has 6 churches, a public high school, business college, co-operative trust company, gravity and Holly system of water-works, electric lights, and a weekly newspaper; and contains an oil-refinery, tannery, several flour-mills, and manufactories of barrels, carriages, furniture, pumps, and cabinet ware. Pop. (1880) 2,171; (1890) 2,261; (1900) 3,104. EDITOR OF "TIMES."

Union City: town; capital of Obion co., Tenn.; on the Mobile and O. and the Nash., Chat. and St. L. railways; 154 miles W. by N. of Nashville, and 204 miles S. by E. of St. Louis (for location, see map of Tennessee, ref. 6–B). It is in an agricultural and stock-raising region, and has 6 churches for white people and 4 for colored, a public school for white children and one for colored, a training-school, 2 hotels, union railway station, electric lights, canning-works, 2 planing-mills, saw-mill, furniture, duck, spoke, and ice factories, a national bank with capital of $50,000, a State bank with capital of $50,000, and 2 weekly newspapers. Pop. (1880) 1,879; (1890) 3,441, with 500 in suburbs; (1900) 3,407. EDITOR OF "DEMOCRAT."

Union College: an institution of learning at Schenectady, N. Y.; incorporated in 1795. It owes its name to the fact that it was founded by a union of several Christian denominations. In 1779 some 500 citizens of Northern and Eastern New York petitioned the Governor and Legislature for the establishment of a college in the city of Schenectady to be named after the first Governor, Clinton. The petition was denied, but in 1785 an academy was incorporated in Schenectady, and on Feb. 25, 1795, this academy became Union College, the charter of the college being the first one granted by the newly constituted board of regents of the State of New York. The first class, numbering three students, matriculated Oct. 19, 1795, when the Rev. John Blair Smith, D. D., assumed the office of president. Dr. Smith resigned in 1799, and was succeeded by Jonathan Edwards the younger, who died in 1801, and was followed by Rev. Jonathan Maxcy, D. D. In 1804 the Rev. Eliphalet Nott, then pastor of the First Presbyterian church at Albany, was elected president, and held the office until his death, in 1866, this being the longest presidential term in the history of colleges in the U. S. During Dr. Nott's presidency the college became one of the foremost educational institutions of the country. Many of the greatest scholars and educators were members of its faculty, among them Francis Wayland, afterward president of Brown University, Alonzo Potter, afterward Bishop of Pennsylvania, Tayler Lewis, Isaac W. Jackson, and William M. Gillespie. The number of students increased steadily until the outbreak of the civil war, when the college suffered greatly from the withdrawal of the large number of Southern students, and from the enlistment of a company of Northern undergraduates, who marched to the front under the command of the Professor of Modern Languages, Elias Peissner. Col. Peissner was killed at Chancellorsville; many of the students never returned from the war, and few returned to the college to graduate. Upon the death of Dr. Nott, Dr. Laurens P. Hickok, who had been vice-president for fourteen years, was elected president and served for two years. In 1869 he was succeeded by the Rev. Dr. Charles A. Aiken, and on his resignation, in 1871, the Rev. Dr. Eliphalet Nott Potter, son of Bishop Alonzo Potter and grandson of President Nott, became president. Under his administration the college made substantial progress. Endowments were increased, new buildings erected, the educational facilities enlarged, and the college advanced in numbers. In 1884 Dr. Potter resigned, and for four years Judge Judson S. Landon was president *ad interim*. In 1888 Harrison E. Webster, LL. D., was elected president, and was followed in 1894 by the Rev. Dr. Andrew V. V. Raymond. In

1873 the Albany Law School, the Albany Medical College, and the Dudley Observatory were united with Union College to form Union University. In 1881 the Albany College of Pharmacy was established and incorporated as a department of the University. Union College was the first nonsectarian college in the U. S.; it was the first to introduce the study of the modern languages, the first to add a scientific course to the time-honored classical course; the first to recognize the importance of technical training, organizing a school of civil engineering in 1845. It also originated the fraternity system, and the oldest of the Greek-letter societies were founded here. It offers to students a choice of courses leading to the degrees of Bachelor of Arts, Bachelor of Philosophy, Bachelor of Science, and Bachelor of Engineering. A department of electrical engineering is now organizing, in co-operation with the General Electric Company, whose great shops are located at Schenectady. The faculty consists of twenty-one members besides twelve regular and many occasional lecturers, and the students number (1900) 192. B. H. RIPTON.

Union'idæ [Mod. Lat., named from *U'nio*, the typical genus, from Lat. *u'nio*, a single large pearl, liter., oneness, unity. See ONION]: a group of bivalve (Lamellibranch) molluscs containing the so-called fresh-water clams and mussels, especially well developed in the U. S., where innumerable so-called species have been described. Each animal has a large foot, a short anal siphon, the branchial siphon present or absent. The shell is equivalve, closed by two adductor muscles. The hinge varies considerably, and the shell is internally nacreous. The fresh-water mussels are unfit for food, and their sole value lies in the pearly character of the shells, for they occasionally produce pearls of value. In Ohio, New Jersey, Wisconsin, and elsewhere in the U. S. many pearls have been found in such mussels, including some valued as high as $2,000. Pearl-fishery was maintained for many years in Scotland, and pearls valued at £10,000 were obtained in the Tay in 1761–64. The industry is also carried on in Germany and China. The chief literature on the American species is Lea's *Synopsis of the Naiads* (1870) and his *Observations on the Genus Unio* (13 vols., 1827–73). The embryology has been studied by Rabl, *Jenaische Zeitschrift f. Naturwiss.*, vol. x. (1876), and Lillie, *Jour. Morphol.*, vol. x. (1895). J. S. KINGSLEY.

Union, La, laa-oon-yōn': seaport; in the southeastern part of Salvador, Central America; capital of a department of the same name; on an arm of the Gulf of Fonseca, called the Bay of La Union (see map of Central America, ref. 6–G). Most of the commerce of the eastern part of the republic centers here, and until recently it was the most important seaport of Salvador. The harbor is good, but the town is somewhat insalubrious. Pop. about 2,500. H. H. S.

Union Springs: town; capital of Bullock co., Ala.; on the Cent. Railroad of Ga.; 40 miles E. S. E. of Montgomery, and 55 miles W. S. W. of Columbus, Ga. (for location, see map of Alabama, ref. 5–E). It is an agricultural and fruit-growing region, and has a college for women, a male and female institute, an academy for males, several cotton-mills, 2 cottonseed-oil mills, 2 grist-mills, 3 ginneries, canning and spoke and handle factories, a State bank with capital of $70,000, an incorporated bank with capital of $52,000, and a weekly newspaper. Pop. (1880) 1,862; (1890) 2,049; (1900) 2,634.
EDITOR OF "HERALD."

Union Theological Seminary in the City of New York: the corporate name of an institution for the training of students for the Christian ministry; at 700 Park avenue. According to the preamble to the constitution, it was the "design of the founders to provide a theological seminary in the midst of the greatest and most growing community in America, around which all men of moderate views and feelings, who desire to live free from party strife, and to stand aloof from all extremes of doctrinal speculation, practical radicalism, and ecclesiastical domination, may cordially and affectionately rally." The first board of directors was elected on Jan. 11, 1836; instruction began on Dec. 5, 1836, in the houses of the professors, and after Dec. 12, 1838, in the first home of the seminary at 9 University Place, where it remained till Sept., 1884, when it was removed to its present quarters. The seminary was incorporated by act of the New York Legislature on Mar. 27, 1839. Its board of directors is a self-perpetuating body. The charter specifies that "the government of the seminary shall at all times be vested in a board of directors," consisting of fourteen ministers and fourteen laymen, and that "equal privileges of admission and instruction, with all the advantages of the institution, shall be allowed to students of every denomination of Christians." No denominational name appears in the charter. Although not under ecclesiastical control, it is a Presbyterian institution, and for some thirty years stood in intimate relations with the New School branch of the Presbyterian Church in the United States of America. During that period several of its professors were moderators of the General Assembly of the Church. After the reunion of the Old and New School branches of the Church in 1870, it granted to the General Assembly a veto power upon the appointment of its professors; but in 1892, in consequence of a difference touching the terms and scope of this veto, and on the ground that it had violated its charter and constitution in conceding such a power, the seminary terminated the agreement of 1870. By the provisions of the constitution it is required that the president of the faculty and the professors of systematic and practical theology shall be ordained ministers, and the adoption of the Westminster Confession of Faith is required of all members of the faculty and directory. In 1894–95 the curriculum was broadened by the introduction of optional and elective courses, and by the extension of the "seminar" method of instruction to an increased number of subjects. There are seven endowed professorships. Connected with the seminary are also three lectureships: The Ely foundation, on *The Evidences of Christianity*; the Morse, on *The Relations of the Bible to the Sciences*; and the Willard Parker, for hygienic instruction. There are also endowed instructorships in vocal culture and music. The scholastic year extends from about Oct. 1 till the middle of May, divided into two terms by the holiday recess. The library contained in May, 1899, about 70,000 volumes, 28,000 pamphlets, and 186 manuscripts. Relations exist with Columbia College and the University of the City of New York, by which the students of the seminary are allowed post-graduate privileges in both these institutions, while members of the colleges may take part of the seminary course as special students. The whole number of students connected with the seminary from its foundation to the close of the year 1894–95 was 2,784, of whom 1,779 were graduates. The seminary confers no degrees, but grants diplomas to those who have pursued the full course.

Among the notable names of those (now deceased) who have been connected with the corps of instructors are Henry White, Edward Robinson, Thomas Harvey Skinner, Henry Boynton Smith, Roswell Dwight Hitchcock, William Adams, Philip Schaff, and William Greenough Thayer Shedd.
CHARLES R. GILLETT.

Uniontown: borough; capital of Fayette co., Pa.; on the national pike and the Balt. and Ohio and the Penn. railways; 40 miles S. E. of Pittsburg (for location, see map of Pennsylvania, ref. 6–B). It is in an agricultural, coking, and iron-mining region; has natural gas, water-works, electric lights, electric street-railway, 2 national banks with combined capital of $200,000, a State bank with capital of $50,000, and a daily and 4 weekly newspapers, and contains 12 churches, 2 public-school buildings, stone court-house and jail, 2 glass-works, and steel and structural iron-works. The borough was laid out by Jacob Beeson in 1783, was first known as Beesontown, and was incorporated in 1796. Pop. (1880) 3,265; (1890) 6,359; (1900) 7,344.
W. F. ULERY.

Unionville: town (founded in 1853); capital of Putnam co., Mo.; on the Chi., Burl. and Kan. City Railway; 44 miles W. S. W. of Bloomfield, Ia., and 140 miles N. of Jefferson City (for location, see map of Missouri, ref. 1–F). It is in an agricultural and coal-mining region, and has 4 churches, 2 public-school buildings, 2 national banks with combined capital of $100,000, and 3 weekly newspapers. Pop. (1880) 772; (1890) 1,118; (1900) 2,050.
EDITORS OF "PUTNAM COUNTY LEADER."

Unita'rianism [deriv. of *unitary*, as if from Lat. **unitarius*, deriv. of *u'nitas*, unity, deriv. of *u'nus*, one]: in theology, the doctrine that God exists in one person only. This involves the denial of the doctrine of the Trinity and the divinity of Jesus Christ. The historical origin of the name is uncertain. Some have traced it to the Transylvanian Uniti, a league of toleration between Roman Catholics, Calvinists, and Socinians. Ever since thinking man has been in the world there have been speculations about the Cause of all things—about its nature, or its action, or the mode of its existence. These speculations have always held to

one Being supreme, while they have been put into various forms—polytheism, trinity, or simple and indivisible unity. The tendency, however, in successive ages, has always been to the latter. In the Jewish and Christian systems this has come to be distinctly maintained; for the Trinity, at least while it is conceived of merely and abstractly as a mode of existence, has not been construed to be a denial of the Unity. It is impossible, perhaps, in strict thesis, to decide which of these views is true; for of the mode of the Divine Existence, if we presume to think upon it, we can not undertake to form any judgment; and it is not the business of this statement to argue for one or the other, but only to give an historical account of the latter—i. e. of Christian Unitarianism.

Judaism was undoubtedly unitarian, and it is held that Christianity was at the start. That the first disciples, who had passed one or two years in daily intercourse with their Master, should have thought of him as God, or, if they did, should have failed plainly and pre-eminently to teach this doctrine, is doubtless hard to believe. It is certain that the earliest churches of which we have any definite knowledge upon this point consisted in the mass, or at least in great numbers, of Unitarians. Believers in Christ at the beginning were simply denominated, as at Antioch, Christians, and doubtless continued to bear that common name; but the oldest body of Christians holding a distinctive faith upon the point in question—i. e. the Ebionites—were undoubtedly Unitarians; and the earliest Fathers, Justin Martyr, Tertullian, and Origen, while advocating their "Economy," the initial form of Trinity, evidently wrote in an apologetic strain, as if they felt that there was a great body of opinion against them; and Tertullian at the end of the second century complains of the mass of people—"*idiotæ*," he calls them—as obstinately opposed to the Economy. And later, Chrysostom and Athanasius undertake with considerable explanation to show why the apostles did not plainly teach the sublimer doctrine of the Economy or Trinity, the reason being that the people were not prepared to receive it. Gradually, however, the early Fathers, falling in with Platonic speculations, were tending to ideas of a Trinity, but it was not till the fourth or fifth century, as J. H. Newman has shown in his *Development of Christian Doctrine*, that the doctrine of the Trinity was completely formulated and established. And this continued for several centuries—except with the great Arian division, which was essentially unitarian—to be the settled orthodoxy of the Church, till in the sixteenth century Unitarianism was revived by the Socini.

Unitarianism in Europe.—Lælius and Faustus Socinus, uncle and nephew, were Italians of a noble family. It is the more remarkable that they should have been learned men and studious in the Scriptures, and that both should have broken off from the religion of their education and social position to embrace new and unpopular opinions—so unpopular and, indeed, dangerous to them, that they both found it expedient to leave, for their evidently honest convictions, their home and country. Lælius went to Switzerland, where he died in Zurich in 1562, after having gone to Germany and Poland and made visits of some length in those countries. After the death of his uncle Faustus resided in Basel, and spent some time in collecting and arranging the papers which Lælius had left to him, and then went to Transylvania, where, with the aid of the celebrated physician Blandrata, a number of Unitarian churches were formed and established. Thence he removed to Poland, and, marrying into a noble family and becoming settled in life, had leisure for study and wrote theological works, which are to be found in the *Fratres Poloni*. His opinions met with favor among the higher classes, with whom he was associated, and it appeared for a time as if he were likely to escape the usual fate of reformers. But his speculations gave offense to the lower classes; they rose against him, and that which happened to Priestley in Birmingham befell him: a mob broke into his house, tore him from a sick-bed, exposed him in the market-place, ransacked his dwelling, and destroyed his manuscripts; and he died near Cracow in 1604, a martyr to his faith. There is still left, however, in Hungary and Transylvania, a considerable body of Unitarians who inherit his faith, and by their character are doing signal honor to his memory. They have 106 churches, with parishes, numbering 60,000 persons. They have parish schools and schools of theology in which are professors who are discharging their duties with salaries scarcely able to support them.

In the British empire there are about 350 places of worship, of which fully 300 are in Great Britain. In Germany the speculations of many of her eminent theologians and critics have been in the direction of Unitarianism, without any formal separation from the Lutheran Church; while in France only the honored names of the Coquerels, father and son, have been distinctly known in connection with it. In England its earliest confessors were men unknown to fame, but remarkable for their virtues—Thomas Firmin, a merchant of London, and well known as a friend of Archbishop Tillotson, and John Biddle, who set up in London the first Unitarian public worship known in England. He was a scholar bred at Oxford, who was able to expound and defend his opinions; who drew upon himself the attention of Parliament and of Cromwell, and of Archbishop Usher to convert him from his heresy; whom courts and judges pursued and hounded through five imprisonments, till on the sixth he died in a dungeon on Sept. 22, 1662, at the age of forty-seven. He was a man whose memory, for his unblemished probity, for his calmness and firmness, and for his cruel fate so bravely met, deserves to be remembered, and would do honor to the lineage of any body of men holding dear their opinions and their history.

Indeed, it is by a lineage of remarkable men that English Unitarianism has been most distinguished—in which are the names of Milton, Locke, and Sir Isaac Newton, William Penn, and Sir William Jones; and of authors such as Nathaniel Lardner, William Roscoe, Samuel Rogers, Charles Lamb, Priestley, Joseph Blanco White and his biographer, J. H. Thom, and James Martineau. The earlier of these were Arians in their Christology, the later Socinians—i. e. humanitarians. Richard Price, however, against whom Burke directed his *Reflections on the French Revolution*, held the Arian opinion in a Socinian generation. The works which have been written expressly in its defense are Emlyn's *Humble Inquiry* and Yates's *Vindication*, and many others. Some of the later writings even of the divine Watts show that although he did not come to any decided result he distrusted his theology and leaned to the Unitarian view. Penn wrote ably against the Trinity and its kindred doctrines in the *Sandy Foundation Shaken*, for which he was put in prison and when he came out sturdily said, "I have not budged a jot." There too, in prison, he wrote *No Cross, No Crown*, a work as remarkable as that other book written in prison, Boethius on *The Consolation of Philosophy*. Also to be mentioned among English Unitarians are Dr. Samuel Clarke, of a former day, Ricardo, the political economist, Sir John Bowring; and not the least to be honored, John Pounds, of Portsmouth, the founder of the ragged school; and of celebrated women, Joanna Baillie and Florence Nightingale.

In the U. S.—Boston, with its vicinity, may be called the birthplace of Unitarianism in America. The controversy which brought matters to that result in a good many churches there and elsewhere in New England, carried on by Dr. Noah Worcester, of Salem, and Prof. Moses Stuart, of Andover, on one side, and William E. Channing and Prof. Henry Ware, Sr., and Andrews Norton on the other, broke out in 1812. Just before, in 1810, Noah Worcester had published his *Bible News*. Nearly thirty years before Dr. James Freeman, of King's chapel, in Boston, had taken the same ground, and his congregation altered the Liturgy in accordance with his views. It was the first church in the U. S. that decidedly espoused the Unitarian faith, though many years before Jonathan Mayhew, pastor of the West church in Boston, was known as an Arian. In Boston and its vicinity also there were several distinguished laymen who took the same side, as the Presidents Adams, father and son, the celebrated jurist Theophilus Parsons, George Cabot, Nathaniel Bowditch the astronomer, Harrison Gray Otis, Daniel Webster, and others. As early as 1718 Dr. Ebenezer Gay, of Hingham, was settled, and became generally known as a Unitarian. In 1794 Dr. Priestley removed to the U. S., and, though he was received with attention in Philadelphia, he chose to retire to Northumberland, Pa., to pursue his philosophical studies, where he also collected a small congregation for worship. Two years after a church was formed in Philadelphia, of which, in 1825, Dr. W. H. Furness became pastor. According to the census of 1890, there were in the U. S. 421 organizations and 67,744 members.

The American Unitarian Association was formed in Boston in 1825, chiefly for the publication and distribution of tracts and books. It has used its funds also to build churches and assist feeble ones, and to send out preachers

in the U. S.; for a number of years supported a missionary in India, the devoted Charles H. A. Dall, who did an excellent work there by his schools, by circulating books, and by publications of his own, and also through communication with the BRAHMA SOMAJ (*q. v.*) and its thousand congregations. Chunder Sen, their chief preacher and leader, visited England, and made a most favorable impression in London (as Rammohun Roy did before him) by his liberal and earnest inculcation of universal religious truth and virtue. Mozoomdar, the successor of Chunder Sen, has maintained relations of the liveliest sympathy with English and American Unitarians.

Tenets.—The first general convocation of the Unitarian clergy of America was held in New York in 1865, consisting of ministers and delegates from the churches; and on this occasion arose and was keenly debated the question about a creed. But the word met with no favor in the conference. With regard to the distinctive tenets of Unitarians, indeed, except that which the name indicates, it is less easy precisely to define them, because Unitarianism is an embodiment of principles—principles of reasoning and criticism—rather than a collection of institutes like the *Institutes* of Calvin or the *Confessions* of Augsburg and Dort, or the *Thirty-nine Articles* of the Church of England. Its history is a history of individual opinions, rather than of organizations, measures, or methods of action. It is biographical, not national. Heresies, as they are called, rather than creeds, are the forms it has taken. Protests rather than professions have marked it. It has been called by its opposers a system of negations, though it is to be considered that every negation implies an affirmation. The affirmations of the conference were—that every man has a perfect right to judge for himself, unbound by any set of articles; that while professing itself to be a Christian body, it left every one to decide for himself what Christianity itself is—i. e. without forfeiting his place in the body, to choose among the conflicting views of Christian doctrine and statement that which seemed to him to be true and right.

In fact, Unitarianism is characterized not so much as being a system of thought as a way of thinking; and *that* may be called, whether for praise or blame, the rational way. Religion it regards as addressing itself to reason and conscience alike, requiring of men to believe nothing which contradicts reason, and to do nothing which they have not ability to do. Human nature, in its view, is not a mass of helpless depravity, but is endowed with moral qualities which are capable of good, and which are to be educated to virtue and religion, just as truly as the mental powers are to be educated to knowledge and the highest intelligence. Human life is appointed to be the sphere of this culture, with all its toils, cares, trials, and sufferings—its natural affections and enjoyments also not to be crushed down, but intended to minister to the same end.

In short, the stand taken by Unitarianism is for nature, for human nature, for everything that God has made, as the manifestation of his will as truly as anything written in the Bible. This world, the world of nature and of life, does not lie under the curse of Adam's sin nor any other curse, but is ordained by infinite wisdom and goodness to be the field of human training for a life to come, whose allotments are to be in accordance with the law that "whatsoever a man soweth, that shall he also reap." Righteousness, and not dogma, is the everlasting condition of all welfare in this world and the next, and what needs to be done for religion is to free it from all falsehoods, from all substitutions of ceremony, profession, and sensational experience for truth and virtue, and thus to purify and rationalize it—to lift it up, not as a terror to men, but as friendship and help, as strength and comfort, as a joy and delight, and so to relieve it of the mystery or misery that it is to many. In fine, the ground taken by this Christian body is that substantially held by the Universalists and to which many other denominations are approaching, and is this—that Christianity is not a philosophy, but a divine power; that the acceptance of it is not the believing in a creed, but believing with the heart; that Jesus Christ himself in his life and death, all dogmatizing apart, is the embodiment of his religion; that he holds that supremacy in the beauty and power of his life which makes it, of all that has appeared upon earth, the fittest to be imitated and followed; and that he who comes nearest to that is the best Christian.

The growth of Unitarianism as an organized body has been more rapid since 1880 than at any time in its history since the division of the New England Churches. In this growth New England has rivaled the Middle West, and the Pacific slope. The average opinions of the body have undergone a great change since Channing's death in 1842. Parker and Emerson are now equally revered with Channing as leaders of the faith. Its most radical but generally accepted criticism of the New Testament is James Martineau's *Seat of Authority in Religion.* Martineau is the acknowledged head of English philosophic thought, and his philosophical opinions attract to him many who find his critical opinions too destructive of the traditional beliefs.

Revised by JOHN W. CHADWICK.

United Armenians: those Armenian Christians who acknowledge the pope, the orthodox Armenians being called Gregorians. The Armenian Rite in the Roman Catholic Church has 1 patriarch and primate (in Cilicia), 4 archbishops (at Constantinople, Aleppo, Seleucia (or Diarbekir), and Lemberg), besides 2 *in partibus*, and 16 bishops. Their union took place 1316–34. They number some 100,000, of whom 78,000 are in Turkey and Persia (20,000 under the Archbishop of Constantinople, 56,000 under the Patriarch of Cilicia, and 1,000 in Mt. Lebanon), and the remainder in Austria-Hungary, Russian Caucasia, and Siberia. The United Armenians, amounting to about 4,000, who with Bishop Kuppelian left the Catholic Church in 1870, returned in 1879 and with him submitted to Leo XIII. See Silbernagl, *Kirchen des Orients*, and Hergenroether's article in Herder's *Kirchenlexikon*, edited by F. Kaulen.

United Baptists: See BAPTISTS.

United Brethren, or **Unitas Fratrum**: See MORAVIAN CHURCH.

United Brethren in Christ: a denomination of evangelical Christians organized in 1800, near Frederick City, Md., with Philip William Otterbein, a German missionary, and Martin Boehm as bishops. The first general conference was held at Mt. Pleasant, Pa., in 1815, when the confession of faith in use was revised and formally adopted. A formal constitution was adopted in 1841. In 1888 this constitution and the confession of faith were revised by a popular vote. Since 1889 lay delegation has been a rule of the Church in both the annual and general conferences. Women have been admitted to the ministry on the same terms as men since 1889. The United Brethren in Christ have sometimes been confounded with the Moravians, *Unitas Fratrum*, or classed with Methodists, though there never was any historical connection between them. The denomination has (1899) 4,234 churches, with a membership of 246,487. It has 2,450 ministers, and operates missions in Africa, Japan, Germany, Canada, China, and Puerto Rico. It has a publishing house and theological seminary in Dayton, O., with headquarters there for all its boards. It has twelve colleges and academies, all coeducational. It has five bishops, who superintend the work in fifty conferences and mission districts. See *United Brethren Church History*, by D. Berger, D. D. (1897).

United Christians of St. Thomas: a body of East Indian Roman Catholics, chiefly found in Travancore, at the southern extremity of India. In 1599 the synod of Diamper (Udiamperur) compelled the ancient Church of St. Thomas Christians (see CHRISTIANS OF ST. THOMAS) to conform to the Church of Rome, conceding to them a modified Syrian rite. In 1653 nearly all fell away, but were soon after induced in great numbers to return, chiefly by the labors of the Barefooted Carmelites. At present more than half are of the Latin rite, but a portion retain the Oriental rite. They are chiefly in the vicariate apostolic of Verapoly (Latin rite), reported as having about 300 priests and 233,000 members. See Germann's *Die Kirche der Thomaschristen* (1877); Assemani, *Bibliotheca orientalis*, iv., p. 2; Silbernagl, *Kirchen des Orients*; G. B. Howard, *The Christians of St. Thomas, and their Liturgies.* Revised by J. J. KEANE.

United Copts: since 1741 the designation of a body of Roman Catholic Copts (native Egyptians) of the Eastern rite. They number (in Egypt) 12,000 or 13,000, and are under a vicar apostolic of their own rite, established (1781) by Pius VI. at Cairo. The United Copts are of two rites, the Egyptian and the Ethiopic or Abyssinian. According to the reports of Roman Catholic missionaries, the latter would appear to be the more numerous. Since 1879 there exists in Egypt a Coptic seminary under the charge of the Jesuits. Their missionaries are also educated at the Propaganda College, Rome. See Werner's *Orbis Terrarum Catholicus* (Freiburg, 1890). Revised by J. J. KEANE.

United Evangelical Church: the state church of Prussia; formed by the union of the Lutheran and Reformed bodies in 1817.

United Greek Church: a body of Roman Catholics of Eastern rite, who accept the papal supremacy and the doctrines of the Roman Church. Their secular clergy are allowed to marry, but only before ordination to deaconship. At any time thereafter they are forbidden to contract marriage under pain of deposition. Their rites are four in number—the Roumanian, the Ruthenian, the Bulgarian, and the Greek Melchite (Greeks of Syria, etc.). The Melchites proper are estimated to number from 75,000 to 100,000. The United Greeks of Bosnia and Herzegovina are about 265,000. In Austria there are over 2,500,000 United Greeks, mostly of Ruthenian rite, and in Hungary 1,500,000. There are some United Russian Greeks of Ruthenian rite in the ancient dioceses of Chelm and Minsk, and there are about 250,000 in Russian Poland, the remnant of those forced by violence to conform to the orthodox Russian Church in 1839. The few Catholic Bulgarians of European Turkey are found at Constantinople and scattered in small numbers through Thrace and Macedonia. The Greek Catholics of Poland numbered 388,223 in 1887. In Southern Italy and in Sicily there are a few Greek Catholics. See Silbernagl, *Kirchen des Orients*; the *Gerarchia Cattolica* (1895); O. Werner, S. J., *Orbis Terrarum Catholicus* (1890). J. J. K.

United Irishmen: the name of an Irish political society formed to aid GRATTAN (*q. v.*) in carrying out his reforms. It was originally a peaceful organization, but about the year 1795, under the influence of THEOBALD WOLFE TONE (*q. v.*), it became active in fostering rebellion against the British Government. Tone was captured in 1798, but the rebellion was not put down till 1800, and was followed by the formation of the United Kingdom of Great Britain and Ireland.

United Kingdom of Great Britain and Ireland: the official designation of the British islands since the legislative union of Great Britain and Ireland in 1801. See GREAT BRITAIN, ENGLAND, IRELAND, SCOTLAND, and WALES.

United Methodist Free Churches: See METHODISM.

United Nestorians: a body of Roman Catholics of the Syrian rite, more often called CHALDEAN CHRISTIANS (*q. v.*), dating from 1553.

United Original Seceders: a Presbyterian sect of Scotland dating from 1820, when a number of ministers of the General Associate Synod refused to reunite with the Associate Synod. For an account of their origin, with recent statistics, etc., see PRESBYTERIAN CHURCH. W. J. B.

United Presbyterian Church of North America: a religious denomination which is the result of the union of several bodies. This makes its early history complex and fragmentary. It is the principal American representative of the Dissenting churches of Scotland. In 1751 the Reformed Presbytery of Scotland sent the Rev. John Cuthbertson to visit the Covenanters settled in Southeastern Pennsylvania; in 1773 two more ministers followed, and in Mar., 1774, they organized the Reformed Presbytery of America. In 1753 the Associate Synod of Scotland "missioned" Messrs. Gellatly and Arnot to those of their faith in the valley of the Susquehanna, and in November of the same year they organized the Associate Presbytery of Pennsylvania. Every Covenanter and Seceder, lay and clerical, in the country was a patriot, a large number entered the Revolutionary army, and when national independence was won they decided to establish a free church in a free state. As both parties held to the same standards and had been kept apart by the union of Church and state in the fatherland, they united Oct. 31, 1782, and formed the Associate Reformed Synod. Two Associate ministers and three or four congregations refused to go into this union, and, re-enforced from Scotland, continued their organization, which grew into a synod. This at the union of 1858 contained 230 ministers, 300 congregations, and 25,000 communicants. By new arrivals from Scotland the Covenanting Church was rebuilt, and has (1895) between 100 and 200 ministers. Instead of one church the union made three, and the Covenanters and Seceders continued to recognize a subordination to the mother churches in Scotland. The Associate Reformed Church prospered, and in 1804 formed a delegated General Synod, but as the church members were scattered from Boston to Georgia and W. to the Wabash, and the means of travel were slow and expensive, its meetings called for too much money and time; so in 1822 it was dissolved and the Church fell apart into the independent but affiliated synods of New York, the West, and the South, and some twelve or fourteen disaffected ministers passed to the Presbyterian Church. All these synods, Associate and Associate Reformed, labored diligently in their respective spheres and were reasonably successful. Their principal field of labor was among those of Scotch-Irish descent, but they did what they could for others, and in addition to their home work they all undertook missionary work in foreign countries. Difficulties and prejudices gradually faded away and a yearning came year by year for closer union and co-operation. They were one in origin, one in faith, one in government, and one in worship, and there could be no sufficient reason why they should not be one in organization. In 1842 a movement was made toward a union, but the negotiations dragged on until May 26, 1858, when the Associate and Associate Reformed Synods, except that of the South, which stood aloof because of slavery, united in Pittsburg, Pa., and formed the United Presbyterian Church of North America. The terms of union were the Westminster standards, with the addition of a Testimony containing eighteen items, which it was thought were not sufficiently stated in the Confession. It holds strictly to the Calvinistic system of theology as set forth in the Westminster Confession, and practices restricted communion, requiring the same qualifications in strangers that it does in its own, and confines its praise service to a metrical version of the Psalms of the Bible. It has always insisted upon the most thorough education of its ministers, a collegiate course, and at least three years of theological training. In the latter it is indeed the pioneer in the U. S., for in 1794 the Associate Church established a theological school at Service, in Beaver co., Pa., under Dr. John Anderson. It was the first fully organized school of the kind in the U. S., with a salaried professor, prescribed curriculum, library, and dormitory. The Associate Reformed Church was also early in this field. In 1805 it opened in New York a theological seminary under the distinguished Dr. John M. Mason, with eight students. The United Church has under its care two theological seminaries with over a hundred students, seven colleges with more than 2,000 pupils, and several classical schools. It has maintained missions in Trinidad, Syria, China, India, and Egypt, but for the sake of efficiency has latterly concentrated all its force upon the last two. In the Punjaub, in India, its mission embraces a synod with three presbyteries, 35 foreign missionaries, over 200 helpers, and 7,000 communicants, and a training-school for native ministers. In Egypt it has a presbytery, 38 foreign missionaries, 325 native helpers, congregations all along the Nile from Alexandria to Assouan, with over 4,000 members, and over 15,000 scholars in its day schools and 6,000 in the Sabbath-schools, and issues a religious newspaper in Arabic. Its home mission work is well organized, stretching from Boston to San Diego, and employing over 200 ministers. Its freedmen's board has large schools in several Southern States, and colleges at Knoxville, Tenn., and Norfolk, Va. It has a large publication house in Pittsburg, which sends forth all needed helps for Sabbath-schools and denominational purposes. The statistics of 1900 show 13 synods, 68 presbyteries, 997 ministers and licentiates, 996 congregations, 128,836 members, 116,091 Sabbath-school scholars, and contributions for all purposes $1,637,425. JAMES B. SCOULLER.

United Presbyterian Church of Scotland: a religious denomination, the third in size of the Presbyterian Churches in Scotland, formed in 1847 by the union of the United Secession Church and the Relief Church.

The larger of these two churches traces its origin back to 1733. The immediate occasion of this first secession from the Church of Scotland was the oppressive exercise of patronage in the "planting of vacant churches"—the dissatisfaction caused by this being intensified by the failure of the Church courts to check or punish what many regarded as grave errors in doctrine. In 1712 the right of patrons to present ministers to vacant congregations, of which they had been deprived in 1690, was restored to them by an act of Parliament; and in 1732 the little that had been left to the people of power, in certain circumstances, to elect their own ministers had been taken away by an act of Assembly, which made the elders and Protestant heritors jointly the electoral body in these cases. At the opening of the Synod of Perth and Stirling, Oct. 18, 1732, the retiring moderator, Ebenezer Erskine, preached a sermon in which he com-

mented on the recent act of Assembly and on other ecclesiastical proceedings in such terms as to bring upon him the censure of the Synod. He appealed, along with three others who adhered to him, to the General Assembly, but only to receive the rebuke of that court (May, 1733) in its turn. They thereupon tabled a protest against being thus wronged, avowing their purpose to preach the same doctrines and to testify against defections as before; and on Nov. 16 the commission of Assembly, to which their case had been referred as one of contumacy (although they were only availing themselves of their legitimate privilege of protest), loosed them from their charges and declared them to be no longer ministers of the Church. Against this sentence these ministers lodged a protestation, maintaining their right to continue the exercise of their ministry though compelled to make "a secession from the judicatories of the Church," and appealing to the "first free, faithful, and reforming General Assembly of the Church of Scotland." A few weeks later (Dec. 5, 1733) "The Four Brethren," as they were called, Ebenezer Erskine, William Wilson, Alexander Moncrieff, and James Fisher, ministers at Stirling, Perth, Abernethy, and Kinclaven respectively, met in a cottage at Gairney Bridge, near Kinross, and after solemn deliberation constituted themselves into a presbytery. This is the point of departure of the new denomination. The Assembly of 1734 empowered the Synod to restore them to their charges, but the evils which they had complained of and for which they had suffered had not been removed, and they could not resile from their secession. Though associated as a presbytery, they "agreed that they would not be too sudden in proceeding to any acts of jurisdiction," and they acted generally with great moderation and caution; for instance, in the title of the "Act, Declaration, and Testimony" which they put forth in 1736 they designate themselves "some Ministers associate together for the exercise of Church-Government and Discipline in a presbyterial capacity." But it soon appeared that there was throughout the country a widespread and increasing sympathy with the attitude assumed by the seceding ministers and the views they expressed. Other ministers joined them; and a greater number, without seceding, openly expressed more or less agreement with them. Many of the people rallied round them, and they had to organize congregations and administer ordinances at the people's call. Upward of thirty seceding congregations had been formed when "The Four," with four others who had joined them, persisting in their secession, were eventually (May 15, 1740) deposed by the Assembly, and ejected from their churches, in which they had till then continued to preach.

"The Associate Presbytery," as the court of these associated minsters had been named, was converted into "The Associate Synod," Oct. 11, 1744, embracing the three Presbyteries of Edinbugh, Glasgow, and Dunfermline. Shortly after this an unhappy division took place, occasioned by Parliament in 1745 (doubtless on account of the Jacobite rising of that time) requiring all persons becoming burgesses in Edinburgh, Glasgow, and Perth to take the following oath: "I protest, before God and your Lordships, that I profess and allow with my heart the true religion presently professed within this realm, and authorized by the laws thereof; I shall abide thereat, and defend the same to my life's end, renouncing the Roman religion called Papistry." The taking of this oath was held by the one party to imply condonation, if not approval, of the still existing evils which had led to the secession, and was therefore not to be tolerated in members of their congregations; the other party denied the alleged implication, and held that the oath might warrantably be taken. The stern conscientiousness of all of them expressed itself in an extremely hot contention, and the separation known as The Breach took place Apr. 9, 1747. Both parties claimed to be the true "Associate Synod," but those opposing the burgess oath came at a later period to call themselves the General Associate Synod. Popularly, however, they were spoken of as Burghers and Antiburghers, and the members of both denominations were ordinarily designated Seceders, especially by outsiders.

Thus separated, the two churches remained apart for upward of seventy years, a strong feeling of antagonism long existing between them. Toward the end of the century diversity of opinion arose in both Synods on the question of the relation of the civil magistrate to matters of religion, and both were divided into what were popularly called New Light and Old Light sections. The New Lights, corresponding to the "voluntaries" of later times, were largely in the majority, and secessions of Old Lights took place—some nine congregations leaving the Burgher Synod in 1799 and four leaving the Antiburgher Synod in 1805. Steps were ultimately taken in the direction of union, and in 1820 the Associate and General Associate Synods united to form "The United Secession Church." The denomination thus incorporated grew and prospered during the twenty-seven years of its existence, taking a prominent part in the so-called voluntary controversy, and initiating and successfully prosecuting important missionary enterprises, but its history was otherwise uneventful.

The Relief Church dates from the formation of a presbytery by three ministers, two of whom had for a considerable time been pastors of ecclesiastically isolated congregations that had been formed in consequence of the intrusion of ministers into charges against the will of the people. Thomas Gillespie, minister at Dunfermline, often regarded as the founder of the Relief Church, had, when minister of the neighboring parish of Carnock, been deposed by the General Assembly of the Church of Scotland in 1752, because, with five other members of his presbytery, who were merely censured, he had refused to take part in inducting a minister at Inverkeithing in the face of the strenuous opposition of the parishioners. Thomas Boston, minister at Jedburgh (a son of the author of the well-known *Fourfold State*), had seceded from the Church of Scotland, in which he held a pastoral charge, to take the oversight of a congregation formed in Jedburgh by nearly all the people of the parish, dissatisfied by the enforced settlement of a minister. These two met at Colinsburgh, in Fife, for the induction of Thomas Colier as pastor of a congregation formed there in 1760 by reclaimers against the settlement of a minister in the parish; and the three Thomases then organized "The Presbytery of Relief," Oct. 22, 1761, "for," as they expressed their purpose in their minute, "the relief of Christians oppressed in their Christian privileges." The Presbytery became "The Relief Synod," with subordinate presbyteries, in 1773. The name assumed by these dissenters was indicative of reaction against oppression. A distinctive feature of this church was liberty of "free communion." While Burghers and Antiburghers were mutually intolerant of attendance at the services of the rival denomination, "visible saints" who were not even Presbyterians were from 1773 permitted by the Relief Church to sit occasionally at times with their members at the Lord's Table.

The United Presbyterian Church (colloquially the "U. P." Church, its members similarly being called "U. P.'s"), in these its lines of ancestry and in its recent development, has been steadily progressive and increasingly prosperous. In 1820 the 154 Burgher congregations united with 129 of the 137 Antiburgher congregations to form the United Secession Church. On May 13, 1847, the Church was incorporated under its present name by the union of the entire number of the United Secession congregations (400) with 118 of the 136 Relief congregations. At the end of 1875 these 518 congregations had increased to 620, with 190,242 members; but in 1876 ninety-eight congregations in England, having over 20,000 members, were, by a friendly readjustment, made over to the Presbyterian Church of England, the religious body in that country which corresponds to and is in close connection with the Free Church of Scotland. At the end of 1894 the U. P. congregations numbered 578, with a membership of 190,950. The returns for 1894 give 848 Sabbath-schools, with 12,565 teachers and 106,682 scholars, and 810 ministers' and elders' classes, attended by 36,803 students. In the Church's foreign mission fields in Jamaica, Trinidad, Old Calabar, Kaffraria, India, China, and Japan 150 fully trained agents and about 750 native helpers are at work; 116 congregations have been formed, and 170 are in process of formation, the total membership being about 20,000. The total income of the Church in 1894 was £391,607, the income for congregational purposes being £262,837. There is a Theological Hall at Edinburgh, conducted by a principal and four professors.

The three large denominations in Scotland are separate, not on account of differences with regard to doctrine, or government, or mode of worship (in all of which, with some diversity of details, they are in substantial agreement), but as a result of the fact that the Church of Scotland is an established and endowed state Church. The United Presbyterian Church is a voluntary church; it is the belief of the vast majority of its members (although this is not a term of communion) that the civil magistrate, in his magisterial capacity, has nothing to do with matters of religion, that church

organizations should be independent alike of state support and of state patronage and control. It can not therefore unite with the Church of Scotland unless that church is disestablished and disendowed. The Free Church professes the belief that some kind of state connection is right, and may be obligatory; but practically its position, as shown by the action of a large majority of its members, differs but slightly from that of the United Presbyterian Church. Like the others, the United Presbyterian Church has as its standards, subordinate to the Scriptures, the Westminster Confession and the Larger and Shorter Catechisms, but adherence to these is professed in view of a Declaratory Act, passed in 1879, which, while reiterating the exception to these standards that the Church has long taken in the line of its "voluntaryism," gives an outline of the doctrines which the Church regards as embodying the substance of the faith, and allows liberty of judgment and of teaching in matters outside of these doctrines. The supreme court of the Church is not a general assembly, but a synod, under which there are twenty-nine presbyteries. Every one who is minister in a charge or is a "pastor emeritus" has a seat in the synod, as also has one representative elder from each congregation, such elder being preferably but not necessarily an elder in that congregation. The United Presbyterian Church was the first of the Presbyterian Churches in Scotland to permit the use of instrumental music in public worship (1872), and it has otherwise taken the lead in so-called "innovations." The Relief Synod sanctioned a collection of hymns in 1794 and another in 1833. The *United Presbyterian Hymn-book*, issued in 1852, considerably in advance of the Church of Scotland and Free Church collections, was superseded by a new book, the *Presbyterian Hymnal*, in 1877. The three Churches have for some time been acting in concert for the production of a common hymn-book, and in May, 1895, the joint committee appointed by them submitted to the three supreme courts the draft of a hymnal designed to be used in Presbyterian services generally. GEORGE M'ARTHUR.

United Provinces: the seven northern provinces of the NETHERLANDS (*q. v.*), united Jan. 23, 1579, at Utrecht, for mutual defense.

United Provinces of La Plata: See LA PLATA, UNITED PROVINCES OF, and ARGENTINE REPUBLIC.

United Secession Church: a religious body formed in Scotland in 1820 by a reunion of the Associate and General Associate Synods. In 1847 it was united to the present United Presbyterian Church. See PRESBYTERIAN CHURCH.

United Society of Believers: See SHAKERS.

United States: a federal republic composed (1901) of forty-five States, three organized Territories, and the District of Columbia, Indian Territory, Alaska, and Hawaii; capital, Washington, D. C.

GEOGRAPHICAL AND PHYSICAL.

The country consists of three detached portions: one, containing five-sixths of the area and over 99 per cent. of the population and wealth, occupies the middle portion of the North American continent, extending from lat. 24° 20′ to 49° N., and from lon. 66° 48′ to 124° 32′ W. from Greenwich; the Territory of Alaska occupies the northwestern part of the continent, and the Hawaiian archipelago is in the Pacific Ocean. The limits of the main body of the U. S. are as follows: The eastern boundary is the Atlantic coast. The northern, beginning at the eastern limit of Maine, extends up the St. Croix river, thence runs northward until it strikes the St. John river, which it follows around the northern end of Maine; then it runs along the highlands which separate the St. John river from the streams flowing into the St. Lawrence river, and follows them to the head of the Connecticut river. This stream serves as the boundary southward to the 45th parallel, along which it runs westward to the St. Lawrence river. It then follows this river, winding among its many islands, to Lake Ontario, passes through the Great Lakes and connecting streams to a point near the head of Lake Superior; then leaving the lake, it follows a chain of small lakes and connecting streams to the Lake of the Woods, W. of which point it follows the 49th parallel to Puget Sound. The western coast is the western boundary of the country. On the south the line is formed by the Gulf of Mexico, the Rio Grande, and thence by a series of parallels and great circles

Obverse. Reverse.

Great seal of the U. S.

to the Pacific coast, which it reaches just S. of the city of San Diego. The boundaries of Alaska are as follows: Beginning at the southern point of Prince of Wales island, the line ascends Portland channel to the 56th parallel of N. latitude; thence runs parallel to the coast and 10 marine leagues inland therefrom as far as the point of intersection of the 141st meridian, thence along the 141st meridian to the Arctic Ocean. The western limit passes through a point in Bering Strait on the parallel of 65° 30′ N. latitude, at its intersection by the meridian which passes midway between the islands of Krusenstern and Ratmanof, and proceeds due N. into the Arctic Ocean. The same limit, beginning at the same initial point, also proceeds in a course nearly S. W. through Bering Strait and Bering Sea, passing midway between the northwest point of the island of St. Lawrence and the southwest point of Cape Choukatski to the meridian of 172; thence southwesterly, including the island of Attu and the Copper island of the Korandorski group in the North Pacific Ocean, to the meridian of 193, including the whole of the Aleutian islands E. of that meridian. The Hawaiian islands lie between lats. 18° 50′ N. and 22° 50′ N., and longs. 154° 50′ W. and 161° 40′ W., 2,700 miles W. of San Francisco. Their total area is 6,449 sq. miles. The following tables summarize the extent of the ocean shore-line and of the land, lake, and river boundaries of the main portion of the country:

OCEAN SHORE-LINE.

COASTS.	Including bays, islands, etc.	Excluding islands.	Excluding islands, bays, etc.
	Miles.	Miles.	Miles.
NORTH ATLANTIC:			
Maine	2,486	784	278
New Hampshire	49	41	18
Massachusetts	886	622	286
Rhode Island	320	245	45
Connecticut	262	240	104
New York	980	50	None.
New Jersey	540	300	120
Delaware	118	106	23
Maryland	509	411	33
SOUTH ATLANTIC:			
Virginia	654	348	116
North Carolina	1,641	1,089	320
South Carolina	756	267	220
Georgia	684	480	128
Florida, east coast	2,474	1,034	472
MEXICAN GULF:			
Florida, west coast	1,562	883	674
Alabama	315	247	58
Mississippi	287	225	88
Louisiana	2,250	1,256	552
Texas	1,330	940	392
PACIFIC:			
California	1,477	1,063	713
Oregon	442	442	392
Washington	1,332	1,028	238
North Atlantic coast	6,150	2,799	907
South Atlantic coast	6,209	3,218	1,256
Mexican Gulf coast	5,744	3,551	1,764
Pacific coast	3,251	2,533	1,343
Totals	21,354	12,101	5,270

LAND, LAKE, AND RIVER BOUNDARY.

	Length, miles.
Along the 49th parallel to Lake of the Woods	1,275
Lake of the Woods to Lake Superior	340
Lake Superior to river St. Mary	300
River St. Mary to Lake Huron	60
Lake Huron to river St. Clair	220
River and Lake St. Clair and river Detroit to Lake Erie	80
Lake Erie to Niagara river	200
Niagara river to Lake Ontario	35
Lake Ontario to St. Lawrence river	160
St. Lawrence river to New York State line (near lat. 45°)	120
Along lat. 45° to Hall's stream	160
Hall's stream and highlands to Maine State line	40
West line of Maine to St. Francis river	220
St. Francis river to St. John river	40
St. John river to New Brunswick line	80
West line of New Brunswick to head of St. Croix river	90
St. Croix river to Passamaquoddy Bay	280
Boundary toward Canada	3,700
Rio Grande to lat. 31° 47′	1,420
Along lat. 31° 47′	100
South line to lat. 31° 20′	30
Along lat. 31° 20′ to lon. 111°	160
From lat. 31° 20′ and lon. 111° to Colorado river	230
Colorado river	20
Colorado river to the Pacific	145
Boundary toward Mexico	2,105
Total ocean, land, lake, and river boundary	11,075

Dimensions and Area.—Greatest extent (excepting Alaska and Hawaii) E. and W., 3,100 miles; N. and S., 1,780 miles. Area (including Alaska, 590,884 sq. miles, and Hawaii, 6,449 sq. miles), 3,622,933 sq. miles.

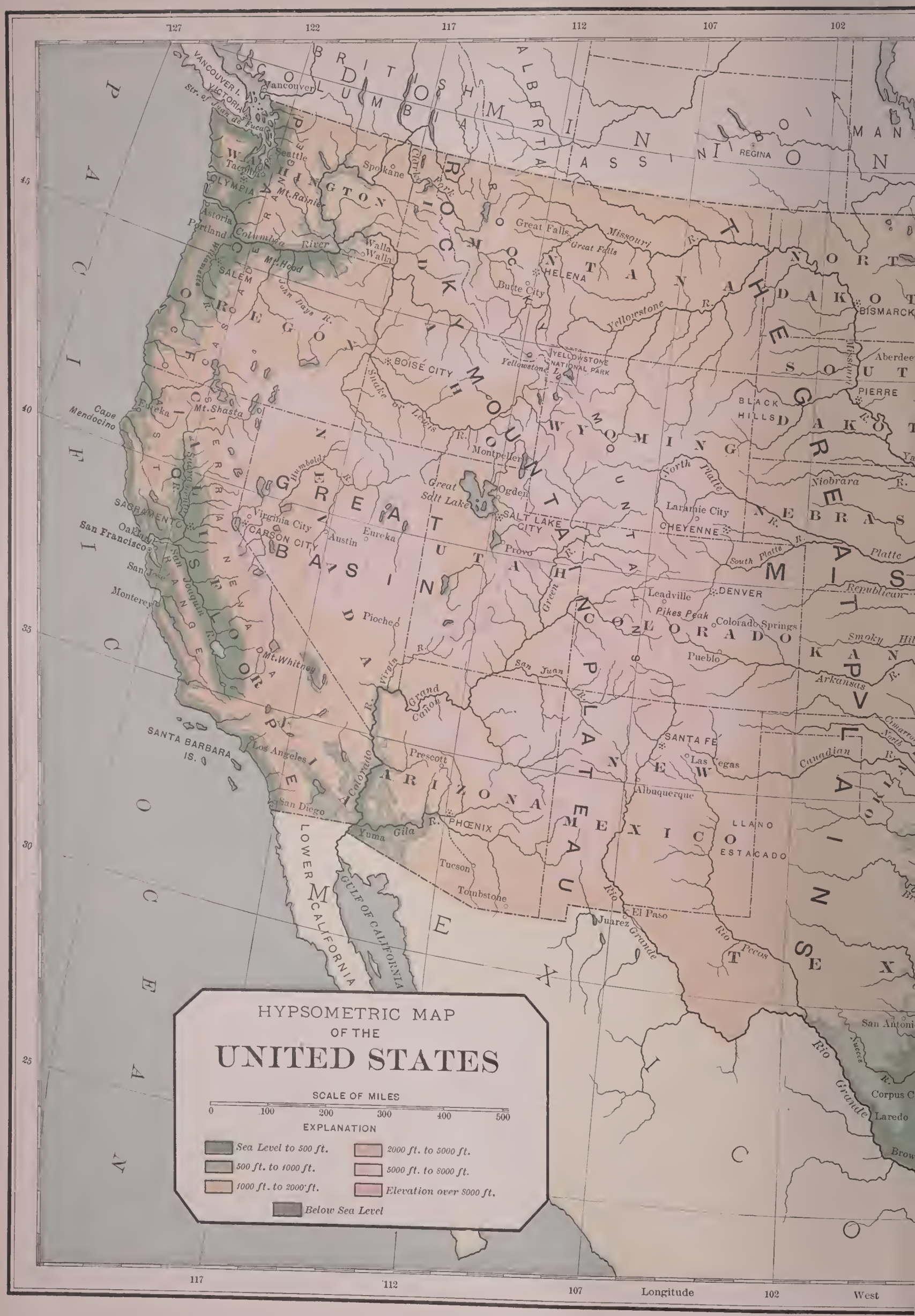
Areas of States and Territories.—The following table gives the areas of the States and Territories (according to the U. S. census report of 1900):

STATES AND TERRITORIES.	Area.	STATES AND TERRITORIES.	Area.
Total	3,622,933	Montana	146,080
		Nebraska	77,510
Alabama	52,250	Nevada	110,700
Alaska	590,884	New Hampshire	9,305
Arizona	113,020	New Jersey	7,815
Arkansas	53,850	New Mexico	122,580
California	158,360	New York	49,170
Colorado	103,925	North Carolina	52,250
Connecticut	4,990	North Dakota	70,795
Delaware	2,050	Ohio	41,060
District of Columbia	70	Oklahoma	39,030
Florida	58,680	Oregon	96,030
Georgia	59,475	Pennsylvania	45,215
Hawaii	6,449	Rhode Island	1 250
Idaho	84,800	South Carolina	30,570
Illinois	56,650	South Dakota	77,650
Indiana	36,350	Tennessee	42,050
Indian Territory	31,400	Texas	265,780
Iowa	56,025	Utah	84,970
Kansas	82,080	Vermont	9,565
Kentucky	40,400	Virginia	42,450
Louisiana	48,720	Washington	69,180
Maine	33,040	West Virginia	24,780
Maryland	12,210	Wisconsin	56,040
Massachusetts	8,315	Wyoming	97,890
Michigan	58,915		
Minnesota	83,365	Delaware Bay	620
Mississippi	46,810	Raritan Bay and lower New York Bay	100
Missouri	69,415		

Physical Features.—The main body of the U. S. presents two great systems of uplift. One is in the East near the Atlantic coast, and is known as the Appalachian system; the other, much higher, broader and more complex, occupies the western third of the country, and is known as the Cordilleran system.

The Appalachians.—The Appalachian system extends from Canada southwesterly into Alabama. The base from which it rises, known as the Atlantic Plain, has in New England an elevation of some 300 or 400 feet at the base of the mountains. Toward the southwest, this plain becomes broader, and at the foot of the mountains is much more elevated, rising in North Carolina to an altitude of about 1,000 feet. The northern part of the Appalachian system is sharply distinguished in character from the southern part. In New England and Northern New York—that is, E. of the Hudson river and N. of the Mohawk river—the system is represented by isolated groups of mountains and by north and south ridges. Of the former type are the Adirondacks of Northern New York, the White Mountains of New Hampshire, and the broken, irregular hills of Maine. Of the latter type are the Green Mountains of Vermont and the Berkshire Hills of Massachusetts. The most important of these in point of altitude are the White Mountains, which rise in the highest summit, Mt. Washington, to an altitude of 6,293 feet, with several other summits in its immediate vicinity approaching 6,000 feet. (See WHITE MOUNTAINS.) Among the Adirondacks the dominant peak is Mt. Marcy, with an altitude of 5,379 feet. (See ADIRONDACK MOUNTAINS.) Among the Green Mountains the highest peaks are Mts. Killington and Mansfield, 4,380 and 4,389 feet respectively (see GREEN MOUNTAINS), and in the Berkshire Hills, Mt. Greylock, in the northwestern corner of Massachusetts, rises far above its fellows, with an altitude of 3,505 feet. In Maine the highest summit, so far as known, is Mt. Katahdin, elevation 5,200 feet. S. and W. of the Hudson river, extending through New York, Pennsylvania, Maryland, Virginia, West Virginia, the Carolinas, Eastern Kentucky, Tennessee, Northern Georgia, and Alabama, the Appalachian system presents a different type. The eastern member of the system, which fronts the Atlantic Plain, is known in Pennsylvania as South Mountain, and in the States farther S. as the Blue Ridge. This is throughout most of its course a single ridge, having an altitude in Pennsylvania of less than 1,000 feet. It rises at the gap cut by the Potomac river at Harper's Ferry to some 1,500 feet above sea-level, and farther S., in Central Virginia it reaches altitudes of 4,000 feet, as in Stonyman, 4,031, and the peaks of Otter, near Lynchburg, 4,001 feet. In North Carolina the character of this ridge changes. It becomes a plateau, with an escarpment to the S. E. and a gentle slope to the N. W., this escarpment having an average elevation of about 4,000 feet. Upon this escarpment and its western slope stand numerous ridges and groups of mountains trending, so far as any trend can be detected, in a northeast and southwest direction. They cover the western portion of North Carolina, extending slightly into Northern Georgia, and among them are found countless peaks exceeding 5,000 feet in altitude, while one short range, known as the Black Mountains, contains several peaks exceeding 6,000 feet. Among them is Mt. Mitchell, which, with an altitude of 6,688 feet, is the highest summit E. of the Rocky Mountains. W. of the Blue Ridge stretches from Pennsylvania to Alabama a broad valley—the Appalachian. It is intersected throughout its entire extent by ranges and ridges, each following the general direction of the valley. These ranges are narrow and abrupt in slope, with level tops extending for scores of miles, except where cut through here and there by water gaps. The streams generally follow the valleys between these ridges. In some places the water gaps are so frequent as to reduce the ridges to lines of knobs. Rising from this valley at its northwestern limit is an escarpment, known in Pennsylvania as the Allegheny Mountains, in Maryland and West Virginia as the Allegheny Front, and in Southwestern Virginia and Eastern Tennessee as the Cumberland Mountain. From the summit of this escarpment a plateau slopes gently to the N., terminating at the Allegheny and Ohio rivers, and limited farther S. by the Blue Grass Region of Kentucky and Tennessee. The escarpment ranges in altitude from 2,500 or 2,800 feet in Pennsylvania to 4,000 feet in West Virginia, diminishing again toward the southward. In most localities it is so deeply scored by streams that there is little except the skeleton of the plateau remaining, its form being that of a succession of abrupt ridges and gorges; the summits of the ridges are nearly all upon the same level, betraying the former altitude of the plateau. In some places, however, considerable areas of the summit have remained intact. This feature is known as the Allegheny plateau in New York, Pennsylvania, and West Virginia, and as the Cumberland plateau in Tennessee. It extends southward to Central Alabama, and dies away into the low country. See APPALACHIAN MOUNTAINS.

The Mississippi Valley.—Between the Appalachian system and the ROCKY MOUNTAINS (*q. v.*) stretches a broad valley, the southern and much the greater portion of which is drained by the Mississippi river and other streams into the Gulf of Mexico, the northern portion into the Great Lakes, and a smaller area into Hudson Bay, by way of the Red River of the North. Speaking broadly, this country is a plain, but looking at it closely it presents irregularities of surface, many of which are significant. The northern portion, near the shore of the Great Lakes, especially upon the upper peninsula of Michigan, Northern Wisconsin, and Minnesota, has been greatly disturbed by the agency of the great continental glacier which in ancient times covered it. In certain regions this glacier eroded the surface, carrying off all the softer rock and leaving the harder and tougher portions standing in the form of miniature mountains, as Keweenaw Point and the Marquette iron range in Northern


HYPSOMETRIC MAP
OF THE
UNITED STATES
SCALE OF MILES
0 100 200 300 400 500
EXPLANATION
Sea Level to 500 ft.
500 ft. to 1000 ft.
1000 ft. to 2000 ft.
2000 ft. to 5000 ft.
5000 ft. to 8000 ft.
Elevation over 8000 ft.
Below Sea Level
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF CALIFORNIA
LOWER CALIFORNIA
BRITISH COLUMBIA
ALBERTA
ASSINIBOIA
MANITOBA
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
UTAH
NEVADA
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
TEXAS
GREAT BASIN
ROCKY MOUNTAINS
MISSOURI
Vancouver
VANCOUVER I.
VICTORIA
Str. of Juan de Fuca
Seattle
Tacoma
OLYMPIA
Mt. Rainier
Astoria
Portland
Columbia River
Mt. Hood
SALEM
Spokane
Walla Walla
Great Falls
HELENA
Butte City
Missouri R.
Yellowstone R.
BISMARCK
Aberdeen
PIERRE
BLACK HILLS
YELLOWSTONE NATIONAL PARK
Yellowstone L.
BOISE CITY
Snake or Lewis R.
Montpelier
Ogden
Great Salt Lake
SALT LAKE CITY
Provo
Laramie City
CHEYENNE
North Platte R.
South Platte R.
Niobrara R.
Platte
Republican
Leadville
DENVER
Pikes Peak
Colorado Springs
Pueblo
Smoky Hill
Arkansas R.
Cimarron
Canadian R.
SANTA FE
Las Vegas
Albuquerque
LLANO ESTACADO
Rio Grande
Rio Pecos
El Paso
Juarez
San Antonio
Corpus C.
Laredo
Brow
Eureka
Mt. Shasta
Cape Mendocino
SACRAMENTO
Oakland
San Francisco
San Jose
Monterey
Virginia City
CARSON CITY
Austin
Eureka
Humboldt R.
Pioche
Mt. Whitney
Los Angeles
San Diego
SANTA BARBARA IS.
Prescott
PHŒNIX
Yuma
Gila R.
Tucson
Tombstone
Colorado R.
Virgin R.
Grand Canon
San Juan R.
Green R.
Rio Grande
Nueces R.
Longitude
West

97
92
87
82
77
72
67
45
40
35
30
25
from
Greenwich
Bradley & Poates, Engr's, N.Y.
CANADA
QUEBEC
Saguenay R.
NEW BRUNSWICK
St. John R.
FREDERICTON
St. Lawrence River
Moosehead L.
Bangor
Penobscot Bay
AUGUSTA
Lewiston
WHITE MTS.
Portland
Portsmouth
CONCORD
BOSTON
Cape Cod
PROVIDENCE
NEWPORT
Montreal
Ottawa
OTTAWA
Kingston
TORONTO
LAKE ONTARIO
Rochester
Syracuse
ALBANY
HARTFORD
Buffalo
Erie
Scranton
Newark
NEW YORK
Brooklyn
LONG I.
Haven
Bridgeport
TRENTON
Philadelphia
JERSEY
Delaware Bay
Baltimore
ANNAPOLIS
WASHINGTON
Potomac R.
RICHMOND
James R.
Cape Charles
Cape Henry
Norfolk
Roanoke
Lynchburg
Albemarle Sound
Cape Hatteras
RALEIGH
WILMINGTON
COLUMBIA
Santee R.
Charleston
Savannah
Augusta
ATLANTA
Savannah R.
Ocmulgee R.
Oconee R.
Altamaha R.
Jacksonville
St. Augustine
St. Johns R.
Cape Canaveral
TALLAHASSEE
Pensacola
Mobile
Chattahoochee R.
Flint R.
MONTGOMERY
Birmingham
Alabama R.
Tombigbee R.
Meridian
JACKSON
Vicksburg
Natchez
BATON ROUGE
New Orleans
Cape Sable
KEYS
Key West
FLORIDA
HAVANA
CUBA
BAHAMA ISLANDS
ATLANTIC OCEAN
GULF OF MEXICO
LAKE ERIE
LAKE HURON
L. MICHIGAN
L. SUPERIOR
Sault Ste. Marie
Bay City
Saginaw
Detroit
LANSING
Grand Rapids
Grand Haven
Milwaukee
Chicago
Michigan City
Fort Wayne
Toledo
Cleveland
Akron
Wheeling
COLUMBUS
Dayton
Cincinnati
Covington
INDIANAPOLIS
Terre Haute
Evansville
Louisville
FRANKFORT
CHARLESTON
Pittsburg
HARRISBURG
Scranton
Erie
Wilmington
Cumberland
Knoxville
NASHVILLE
Chattanooga
Memphis
LITTLE ROCK
Ft. Smith
Hot Springs
Pine Bluff
Tahlequah
Arkansas R.
Red R.
Paris
Denison
Dallas
Ft. Worth
Marshall
Trinity R.
Neches R.
Sabine R.
AUSTIN
Houston
Galveston
GALVESTON I.
Velasco
Wichita
Vinita
GUTHRIE
JEFFERSON CITY
St. Louis
SPRINGFIELD
Cairo
Ohio R.
Wabash R.
Illinois R.
Missouri R.
Kansas R.
Kansas City
TOPEKA
Leavenworth
Beatrice
St. Joseph
Quincy
Burlington
Peoria
Davenport
Dubuque
DES MOINES
Council Bluffs
Omaha
Sioux City
Des Moines R.
Winona
La Crosse
MADISON
Oshkosh
Eau Claire
Minneapolis
ST. PAUL
Minnesota R.
Fargo
Lake Itasca
Duluth
WINNIPEG
L. of the Woods

Michigan. In other parts, especially farther S. and W., the glacier deposited material in the form of drumlins and moraines. In Southern Ohio and Indiana streams tributary to the Ohio river cut their courses deeply, leaving considerable relief in the form of bluffs. The Ohio, Mississippi, Missouri, and other streams are also bordered by high bluffs throughout much of their course. The greatest relief in the Mississippi valley is afforded by the Ozark Hills. These, like the Appalachian Mountains, present two different characters of surface. S. of the Arkansas river, in Western Arkansas and Southern Indian Territory, they consist of a group of narrow, abrupt ridges, which in spite of their serpentine course have a general E. and W. trend. They rise to altitudes of 2,500 to 3,000 feet above the sea. N. of the river the Ozark Hills consist of a plateau presenting an escarpment to the S., with a gentle slope N., the surface being deeply scored by streams. From the Mississippi and lower Missouri rivers the country rises gradually in a long incline over a breadth of more than 500 miles to the base of the Rocky Mountains. This great incline, known as the Great Plains, extends from the northern to the southern boundary of the country, and forms one of its grandest features. Its eastern base has an altitude ranging from sea-level to perhaps 2,000 feet, while at the base of the Rocky Mountains the plains range from 4,000 to 8,000 feet above the sea.

The Rocky Mountains.—This system is a part of the great Cordilleran mountain system which borders the Pacific coast through North and South America, extending from the Aleutian islands and Alaska through British Columbia, the U. S., Mexico, and the Central American republics, and thence, as the Andes, through South America to Cape Horn. In the U. S. this system has its greatest breadth and complexity. It extends from lon. 105° to 124°, and comprises an area which may be roughly estimated at one-third that of the country, or in the neighborhood of 1,000,000 sq. miles. The mountain ranges stand upon a plateau, the eastern slope of which is the Great Plains. This plateau has an altitude ranging from 4,000 to 10,000 feet, being highest in Colorado and diminishing in elevation to the N. and S. The great rivers here indicate by their courses the directions of slope of the plateau upon which the mountains stand. The region may be divided for purposes of description into a number of districts, the Stony Mountains, the Park Ranges, the Plateau region, the Great Basin, the Cascades and Sierra Nevada, the Pacific valley, and the Coast Ranges. The Stony Mountains form the eastern member of this system, fronting the plains in Montana, Idaho, and Wyoming. They consist of a number of ranges, generally parallel, and trending slightly W. of N. and E. of S. In Montana few of the peaks exceed 12,000 feet, while the general altitude of the ranges here is 9,000 or 10,000 feet. In Wyoming, one of the members of this sub-system, the Wind River Range, which separates the head of the Big Horn from Green river, rises to nearly 14,000 feet. In Southern Wyoming the Stony Mountains disappear, and are succeeded by a broad plateau having an average altitude of fully 8,000 feet. This break in the continuity of the ranges is traversed by the Union Pacific Railroad, so that the traveler by this route crosses most of the Rocky Mountain region without passing among mountains. In Southern Wyoming, near the Colorado boundary, the Park Ranges rise from the plateau, and in Colorado they reach their greatest altitude and complexity. Here are a score of mountains exceeding 14,000 feet in height, and hundreds exceeding 13,000 feet, and here also the plateau from which they spring attains its greatest altitude. In these high mountains are the head branches of the Platte, Rio Grande, Arkansas, and Grand rivers, the latter a fork of the Colorado river. Farther southward in New Mexico the ranges begin to die away, and in the neighborhood of Santa Fé their continuity disappears. In Utah there is a range which is in the nature of a spur from the Stony Mountains, known as the Wasatch Range. It extends S. along the eastern border of Great Salt Lake and its system of tributary lakes to the central part of the Territory.

Plateau Region.—The region drained by the Colorado is hardly paralleled on the earth. It consists of cañons and of plateaus whose surfaces are horizontal or but slightly inclined and terminated by cliffs. All streams flow in cañons —deep, narrow gorges with precipitous and even vertical walls. Besides those cut by living streams, there are many in which at ordinary times no water flows, so that in many places the plateau is a mere skeleton of narrow, flat ridges, separated by equally narrow, precipitous gorges. Of these cañons, the series which has been cut by the Colorado is the most remarkable. It culminates in the Grand Cañon in Northern Arizona, which at its deepest part exceeds 6,000 feet. From summit to summit of the plateau the distance is in many places from 10 to 12 miles, the walls descending from top to bottom of the gorge by a series of precipitous steps.

The Great Basin.—W. of the Wasatch Range, comprising parts of Utah, Nevada, California, and Oregon, is a region which, owing to its deficient rainfall, has no natural system of drainage. It is, in fact, not a single basin, but a vast number of basins, most of which have no connection by drainage lines with other basins. The streams which flow down from the mountains on its expanse sink into the earth or are evaporated. This basin is intersected by many mountain ranges, trending generally parallel in a direction nearly N. and S. Their bases are buried deeply in the detritus worn down from their sides and deposited in the intervening valleys. The principal basins among the many which are found on its surface are those of the GREAT SALT LAKE (*q. v.*), at the west base of the Wasatch Range, and those of the Carson and Humboldt at the east base of the Sierra Nevada. See GREAT BASIN.

Cascades and Sierra.—Traversing Washington, Oregon, and California is a system of mountains known in its northern part as the Cascade Range and in the southern as the Sierra Nevada. The former is a volcanic plateau, from which rise numerous cones to altitudes of 12,000 to 14,440 feet. Among these are Mts. Rainier, Shasta, and Hood, 14,444, 14,350, and 11,225 feet respectively. (See CASCADE RANGE.) The Sierra Nevada rises with an abrupt, precipitous front to the E., and a long, deeply eroded slope to the W. The altitude, which in the northern part of California is perhaps 12,000 feet, increases southward until near its southern end it has many peaks from 14,000 to 15,000 feet. From this point it descends rapidly in altitude, swings around to the S. and joins with the Coast Ranges. (See SIERRA NEVADA.) W. of the Cascades and Sierra Nevada lies a long valley trending parallel to the coast, which in Washington is occupied partly by Puget Sound and several minor streams; in Oregon by the Willamette, Umpqua, and Rogue rivers, and in California by the Sacramento and its tributary, the San Joaquin. This valley is the great wheat-field of the Pacific coast. Separating it from the coast is a series of ranges and ridges, known collectively as the Coast Ranges. In Northwestern Washington a part of them are known as the Olympic Mountains, and exceed 8,000 feet. In Oregon these ranges are of little importance, but in Northwestern California they rise again to a considerable height. The system is broken through by the Bay of San Francisco, rises again to the S., and in Southern California reaches a height of 3,000 to 4,000 feet.

Altitude.—The mean elevation of the U. S., excluding Alaska, is about 2,500 feet. The areas of the different zones of elevation above sea-level are given in the following table:

Zones, feet.	Areas, sq. m.	Zones, feet.	Areas, sq. m.
0 to 100	200,510	1,000 to 2,000	636,596
100 to 500	388,305	2,000 to 3,000	262,635
500 to 1,000	545,770	3,000 to 4,000	182,800
		4,000 to 5,000	263,830
0 to 1,000	1,133,835	5,000 to 6,000	215,160
		6,000 to 7,000	159,515
1,000 to 1,500	396,080	7,000 to 8,000	93,109
1,500 to 2,000	240,516	8,000 to 9,000	39,000
		9,000 to 10,000	19,110
		Above 10,000	19,260

River Systems.—The river systems may be grouped into four grand divisions, viz., the Northern Lake, Atlantic, Gulf, and Pacific. The first consists of Lakes Superior, Michigan, Huron, Erie, and Ontario, together with their connecting and tributary streams, the water of which is poured by the St. Lawrence into the Atlantic Ocean. These lakes and the St. Lawrence river form a navigable system which is exceeded in the U. S. only by the Mississippi river and its tributaries, and bears an amount of traffic which in bulk is equaled by that of few waterways. From the mouth of the St. Lawrence to the head of Lake Superior is nearly 2,400 miles. The following table presents the area, dimensions, depth, and elevation of the Great Lakes:

LAKES.	Area, square miles.	Length, miles.	Breadth, miles.	Depth, feet.	Elevation, feet.
Lake Superior	31,200	412	167	1,008	602
Lake Huron	21,000	263	101	702	581
Lake Michigan	22,450	345	84	870	581
St. Clair	396	29	..	19	576
Erie	9,960	250	60	210	593
Ontario	7,240	190	54	738	247

With this system may be associated for convenience the Red River of the North, which drains a small area in Minnesota and the Dakotas northward through Lake Winnipeg into Hudson Bay. The entire system embraces 175,340 sq. miles of territory. See articles on the Great Lakes severally, NIAGARA FALLS, and ST. LAWRENCE RIVER AND GULF.

The second division comprises all those streams which flow E. and S. into the Atlantic, including all those E. of the Appalachian Mountains. These are all comparatively short streams, navigable only a short distance above their mouths. Among them are the Penobscot, Kennebec, Connecticut, Hudson, Delaware, Susquehanna, Potomac, Rappahannock, James, Roanoke, Neuse, Cape Fear, Pedee, Santee, Edisto, Savannah, Ogeechee, Altamaha, and St. Johns. The area of this division is estimated at 276,890 sq. miles. The third division embraces the Mississippi system, including the great river with all its tributaries, and also the streams of Western Georgia, Western Florida, Alabama, Mississippi, Louisiana, and Texas, which flow into the Gulf of Mexico. The total area of this division is 1,725,980 sq. miles, or more than half the territory of the U. S., excluding Alaska, and of this great area 1,240,039 sq. miles is drained by the Mississippi and its tributaries, the principal of which, with their several drainage areas, are as follows:

River.	Drainage area.
Missouri	527,155
Ohio	201,720
Arkansas	185,671
Red	89,970

Among other tributaries which elsewhere would be important, but are here of secondary importance, are the Minnesota, Desmoines, Illinois, and Yazoo. Of the rivers emptying directly into the Gulf the most important are the Suwanee, Appalachicola, Mobile, Pearl, Sabine, Trinity, Brazos, Colorado of Texas, Nueces, and Rio Grande. (See MISSISSIPPI, MISSOURI, OHIO, etc., rivers.) The fourth division, that of the Pacific, has an area of 619,240 sq. miles. The principal rivers of this system are the Columbia, with its great branch, the Snake; the Sacramento; and the Colorado of the West. (See COLUMBIA, SACRAMENTO, and COLORADO rivers.) Besides the areas enumerated is to be considered the Great Basin, which has an area of 228,150 sq. miles.

Alaska.—The topographic features of Alaska are very simple. The Cordilleran system passes up through Canada, following the Pacific coast, and enters Alaska in its southeastern part. This portion of Alaska is entirely occupied by these mountains. Proceeding to the N. W., they hug the coast closely as it swings around to the W. and S. W., ultimately dropping into the sea, from which their summits emerge as the islands of the Aleutian Archipelago. Their greatest elevation in Alaskan territory, so far as definitely known, is Mt. St. Elias, 18,100 feet. N. of the Cordilleras is mainly a great plain, stretching northward to the Arctic Ocean. The great river is the Yukon, which, rising in the mountains of Southeastern Alaska and British Columbia, flows N. and then W. to the Bering Sea. In length and volume of water it ranks among the great rivers of the continent. See ALASKA and YUKON RIVER.

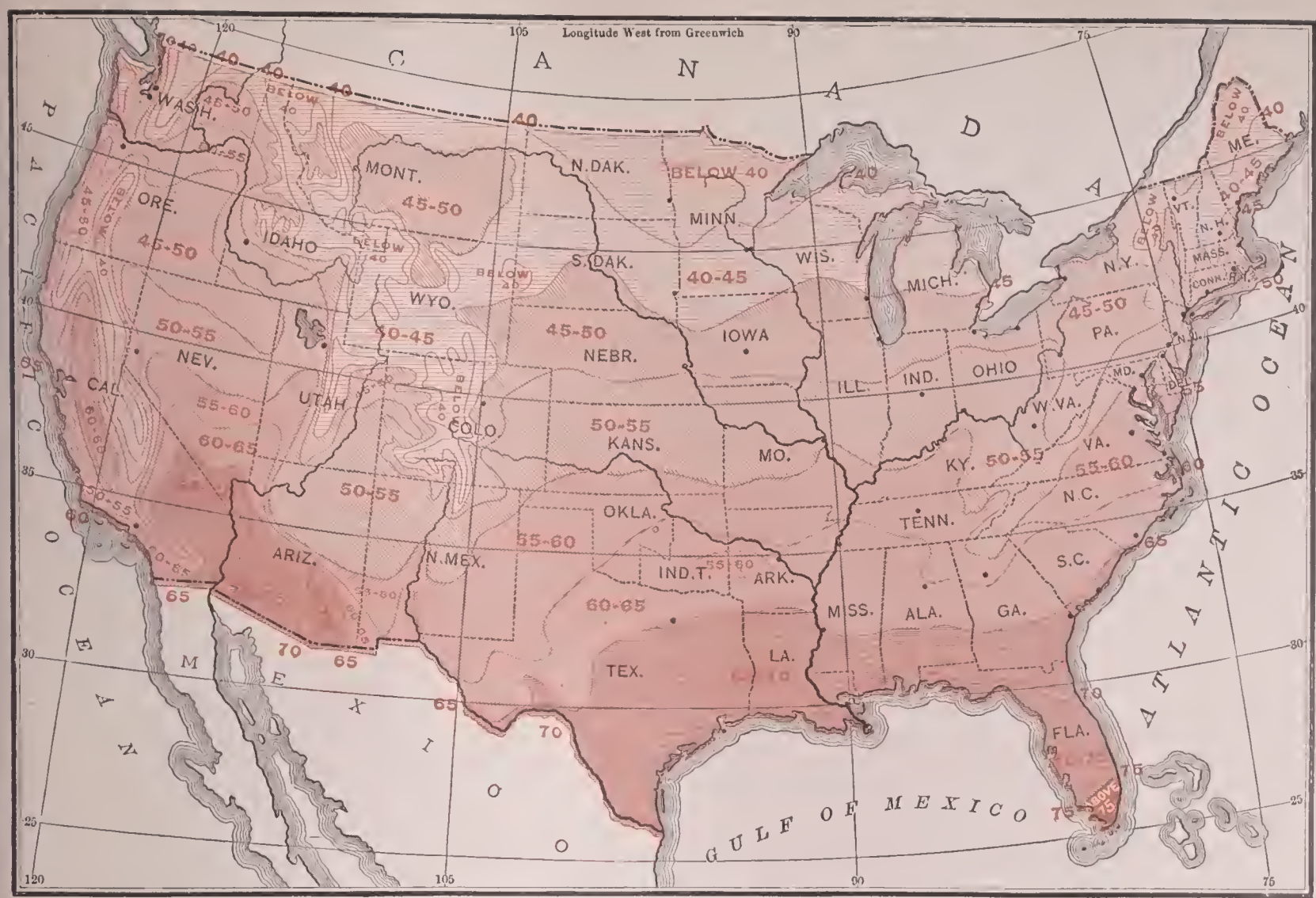
Geology.—The most ancient part of the U. S., from a geological point of view, is the northern portion of the Appalachian Mountains, together with the western portion of the Atlantic Plain in the Southern States, including the Blue Ridge. The eastern limit of this ancient Archæan region is indicated by the fall line on the rivers flowing to the Atlantic Ocean. At this point the rivers pass from ancient to recent rocks, from hard to soft rocks, and the point is marked by falls or rapids in the streams, which put an end to navigation from the sea and which have been utilized for water-power. This fall line is at Trenton on the Delaware, Philadelphia on the Schuylkill, Georgetown on the Potomac, Richmond on the James, Columbia on the Santee, and Augusta on the Savannah. Seaward from these points the surface rock is of Tertiary age, and these Tertiary beds, extending around the southern end of the Appalachian system and up the Mississippi valley to Cairo, occupy much of Arkansas and Texas, and all of Louisiana. The upper part of the Mississippi valley is occupied mainly by the Carboniferous, Devonian, and Silurian formations, the first being predominant. The Great Plains are more recent, being mainly covered by Cretaceous and Jura Trias. The Rocky Mountain region is one of extended and violent volcanic action. By the slow action of internal stresses and strains, the mountain ranges have been slowly upheaved, and violent action has resulted in the pouring forth of lava which has spread over enormous tracts, as the Snake river plains of Idaho. Much of this work is recent, and in the Yellowstone Park in Wyoming the remains of its action are still visible in the form of thousands of hot springs and geysers. See GEOLOGY, and especially the geological maps of the U. S. accompanying that article; also the articles on the various geological periods, formations, and groups.

Climate.—The climate of the U. S. ranges widely in different parts, since the country stretches over twenty-four degrees of latitude and from sea-level to 15,000 feet elevation. With every variation of surface it possesses every variety of climate, from that of the tropics to that of the Arctic regions. It is at the same time one of the hottest and one of the coldest countries; one of the wettest and one of the driest.

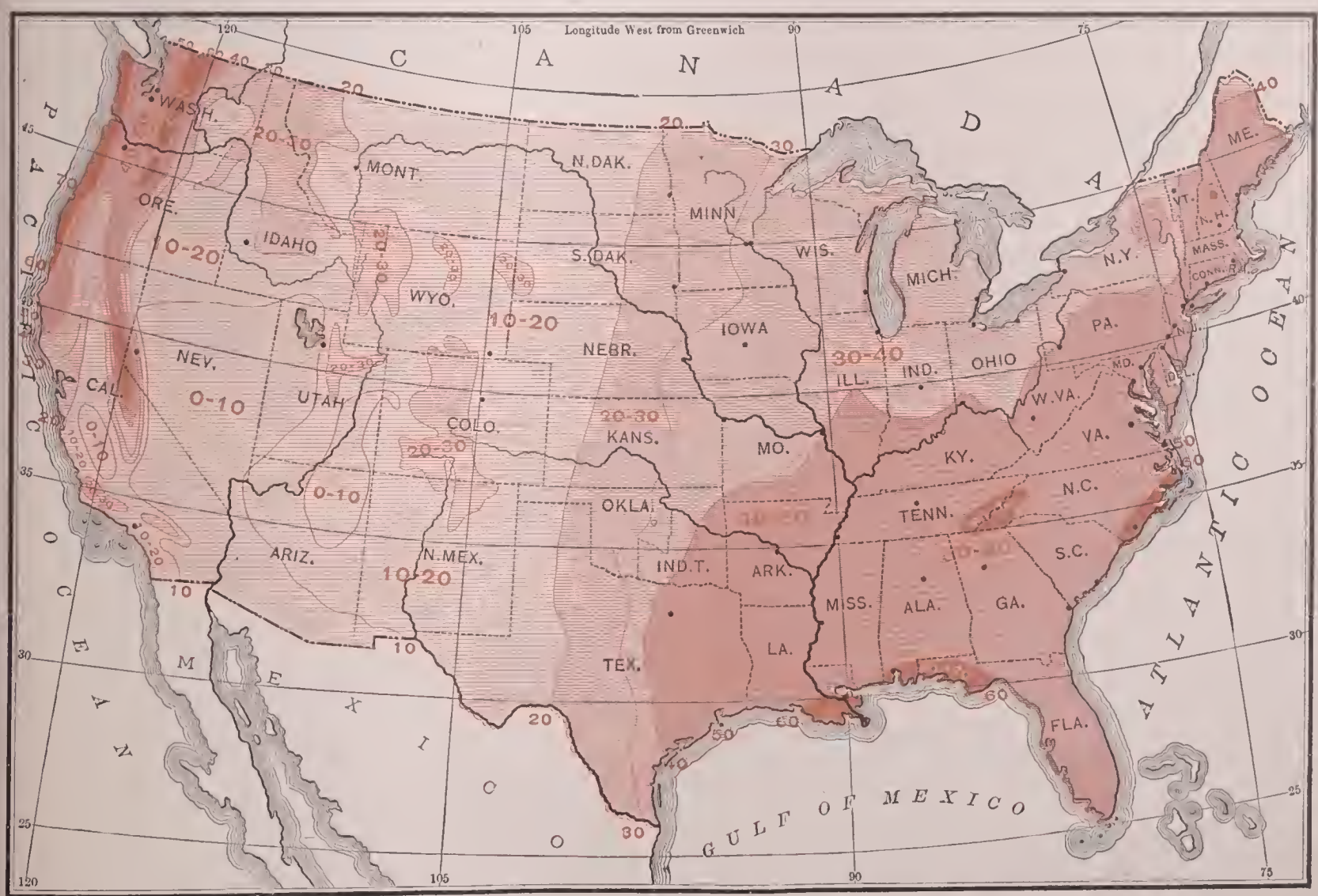
Temperature.—The temperature ranges with the latitude and the altitude. Along the Gulf coast and on the lower Colorado the mean annual temperature is 75° F., thence it diminishes until at the northern boundary it falls below 40°, while on the high peaks of the Rocky Mountains it is far below freezing-point. The average annual temperature of the whole country is estimated at 53° F. In the eastern part, which has a moist climate and an ample rainfall, the range between summer and winter is not so great, but in the Rocky Mountain region, where the altitude is great and the climate arid, the range is extensive.

Rainfall.—The rainfall differs greatly in different sections. Over the eastern half it is abundant, over most of the western half it is scanty, and on the northern part of the Pacific coast it is often excessive. The South Atlantic and Gulf coasts receive an annual rainfall exceeding 60 inches; thence northward the precipitation diminishes gradually until about the Great Lakes it commonly does not exceed 30 inches. It diminishes also westward on the slope of the plains, and over most of the Rocky Mountain region it ranges from 10 to 20 inches, being naturally greater on the mountains and less on the valleys and plateaus. In the Great Basin and Southwestern Arizona it is commonly less than 10 inches, and in some localities for years no rain falls. On the northern Pacific coast the rainfall is very heavy, in some localities exceeding in certain years 100 inches, while in the Pacific valley in Oregon and Washington it commonly ranges from 40 to 50 inches. The average annual rainfall on the country as a whole is estimated at 26·7 inches. Over the eastern half of the country the winter rainfall exceeds the summer. The same is the case in so much higher degree on the Pacific coast that the winter is locally known as the rainy season and the summer as the dry season. In the Rocky Mountain region, however, these conditions are reversed. Of the scanty rainfall the greater part falls in summer, and the winter is practically dry, because in winter the ranges near the Pacific coast drain the moisture from the air-currents, while in summer these currents carry most of their moisture over these ranges and deposit it on the mountains and plateaus farther E. See CLIMATE and METEOROLOGY.

Flora.—The flora of the U. S., as might be inferred from the wide range of soil, topography, and climate, is both rich and varied. Tropic species are found in the extreme south, in Florida, Texas, California, and Arizona, and near the northern border and on the high mountains boreal species are found. Throughout the greater part of the country the species are those of the north temperate zone, and are, to a great extent, peculiar to North America. The whole number of indigenous species, exclusive of the lower cryptograms, probably amounts to 5,000, many of which have a wide range. The number of woody species is not less than 800, and over 400 are large enough to be called trees, 250 of which are common. Of the larger and more important, excluding all the smaller and rarer ones, and also those tropical forms found only along the extreme southern border, there are about 120 species in sufficient abundance to have economic importance. Twelve of these occur 200 feet high, and five or six are sometimes 300 or more feet. About 50 of the 120 species belong to the *Coniferæ*. Compared with Europe the local floras are poorer in the actual number of species but vastly richer in trees, many of which belong to older types. The hickories, sequoias, magnolias, liquidambar, sassafras, etc., so abundant or noteworthy in the New World, are only found fossil in the Old. The U. S. has contributed a few species to the useful plants of cultivation. Many valuable varieties of grasses have originated from native species. Near the Atlantic coast and along the southern borders European explorers found maize, squashes, tobacco, and other useful plants in cultivation among the Indians.



Mean annual temperature in degrees Fahrenheit.



Mean annual rainfall in inches.

The forests are mainly confined to the eastern, well-watered portion of the country. The Atlantic States and those bordering the Gulf westward as far as Central Texas are mainly covered with heavy forests, except where cleared by man. This region includes many of the States of the Mississippi valley, its western limit following roughly the line between Oklahoma and Indian Territory and the western boundary of Missouri as far N. as the mouth of the Kansas river, whence it turns E., excludes the prairies of Northern Missouri, and passes across Southern Illinois, Northern Indiana, and Southern Wisconsin. In Minnesota the line may be said to follow the course of the Minnesota river, and near its head it turns N., following the eastern edge of the Red river valley to the Canadian border. This limit is not a definite line, but a broad belt of country, in which the forests gradually become thinner until they disappear. The plains are treeless, except a narrow belt along the watercourses, and are covered with grasses, grading in the more arid regions into artemesias and cacti. In the Rocky Mountain region, excepting in the extreme N. W., there are no forests, tree vegetation being found, as a rule, only upon the mountains. The valleys and plateaus are covered in the north with artemesias and other desert shrubs, and in the south with cacti, Spanish bayonet, and other plants peculiar to the desert. In Western Washington and Oregon and on some of the elevated plateaus and valleys of Western Montana, the rainfall is sufficient to induce forest growth. This is especially the case W. of the Cascade Range, where the rainfall is superabundant and the forests are luxuriant. It is estimated that altogether, allowing not only for those regions naturally devoid of forests, but those which have been cleared by man, 38 per cent. of the country, or a little over one-third, excluding Alaska, is covered with tree growth. In the low country bordering the Atlantic and Gulf plain the prevalent timber is pine, of various species; in the South the long-leaved, short-leaved, and loblolly pines, in the North the white pine. In the Appalachian Mountains and the upper Mississippi valley, broad-leaved, deciduous trees, oaks, chestnuts, walnuts, poplars, and cherry predominate; and about the lakes and generally in the northern part of the country, pines, firs, spruces, and larches are most abundant. In Western Washington and Oregon, and in the Coast Ranges and Sierra Nevada, the forests consist mainly of coniferous trees. In the latter regions the forest growth has its greatest development. In the Sierra are found the gigantic sequoia and sugar pines, and on the Coast Ranges are found redwoods. See FORESTRY and the names of individual trees.

Fauna.—In general, the fauna is the same as that of North America, which is especially rich in fresh-water forms, for the reason, doubtless, that North America has been a continent ever since the Carboniferous period. The species of vertebrata described number about 2,250, the principal of which may be classified as follows: Mammalia, 310; Aves, 756; Reptilia, 257; Batrachia, 101; Pisces, 816. The Mollusca found in rivers and lakes number 1,034 species; about 400 more are terrestrial and air-breathers; the marine species are very numerous, but nothing approaching a complete enumeration is possible. Of the number of species in the inferior division of the animal kingdom only the rudest estimates can be made. Of the larger quadrupeds, the buffalo, once extremely abundant on the plains and in the Rocky Mountain region, is now practically extinct. The elk or wapiti, several species of deer, and the antelope are still found in unsettled regions. The black cinnamon and grizzly bears are found away from the haunts of man, and on the plains and among the mountains wolves of several species are abundant.

POPULATION AND RACES.

The census of the U. S. is taken, under a provision of the Constitution, every ten years. The work is done under a superintendent, with headquarters in Washington. The country is divided into districts, of which at the census of 1900 there were 300, each under the control of a supervisor, who reported directly to the superintendent. Each supervisor's district was divided into a large number of enumeration districts, and to each was assigned an enumerator. A house-to-house and farm-to-farm canvass is made in the month of June. The results are tabulated in the office in Washington. See CENSUS, and for 1900 returns UNITED STATES in the Appendix.

Population.—The population June 1, 1890, was 62,622,250, showing a rate of increase of about 25 per cent. in the ten years preceding. This total does not include the population of Alaska, or Indians living on reservations or in tribal relations. Adding these the population closely approximated 63,000,000. The density of population, counting all the inhabitants and the entire area of the country, was 17·37 per square mile. The following table shows the population at each census, the rate of increase, and the average number of inhabitants per square mile:

CENSUS.	Population.	Per cent. increase.	Density.
1790	3,929,214		4·75
1800	5,308,483	35·10	6·41
1810	7,239,881	36·38	3·62
1820	9,633,822	33·07	4·82
1830	12,866,020	33·55	6·25
1840	17,069,453	32·67	8·29
1850	23,191,876	35·87	7·78
1860	31,443,321	35·58	10·39
1870	38,558,371	22·63	10·70
1880	50,155,783	30·08	13·92
1890	62,622,250	24·86	17·37

The Settled Area.—Adopting the census definition of a settled country, that is, one which has a population of two or more to the square mile, the settled area in 1890 comprised nearly 2,000,000 square miles, or somewhat more than half the area of the entire country, and about two-thirds of its area, excluding Alaska. The following table shows the settled area at each census, and the proportion which it bore to the total area:

SETTLED AREA AT EACH CENSUS.

CENSUS.	Settled area, square miles.	Proportion of settled to total area, per cent.
1790	239,935	29
1800	305,708	37
1810	407,945	20
1820	508,717	25
1830	632,717	31
1840	807,292	39
1850	979,249	33
1860	1,194,754	39
1870	1,272,239	35
1880	1,569,570	44
1890	1,947,285	54

Center of Population.—The center of population is the center of gravity of the population, each individual being supposed to have the same weight and to press downward with a force proportional to his distance from that center. The movements of this point from census to census constitute a net resultant of all the movements of population. The following table, with the accompanying map, shows this movement since the first census. In a century the center has moved well into Indiana from a position near Baltimore, keeping all the time close to the 39th parallel:

POSITION OF THE CENTER OF POPULATION.

1790	39° 16·5′ N. lat.,	76° 11·2′ W. lon.
1800	39° 16·1′	76° 56·5′
1810	39° 11·5′	77° 37·2′
1820	39° 5·7′	78° 33·0′
1830	38° 57·9′	79° 16·9′
1840	39° 2·0′	80° 18·0′
1850	38° 59·0′	81° 19·0′
1860	39° 0·4′	82° 48·8′
1870	39° 12·0′	83° 35·7′
1880	39° 4·1′	84° 39·7′
1890	39° 11·9′	85° 32·9′

Urban Population.—The urban population has increased at a much more rapid rate than the total population. In 1790 the inhabitants of cities of 8,000 or more constituted but 3 per cent. of the total population. In 1890 they constituted 29 per cent. The increase of the urban element is set forth in the following table:

URBAN POPULATION AT EACH CENSUS.

CENSUS.	Urban population.	Proportion of urban to total population, per cent.
1790	131,472	3
1800	210,873	4
1810	356,920	5
1820	475,135	5
1830	864,509	7
1840	1,453,994	9
1850	2,897,586	12
1860	5,072,256	16
1870	8,071,875	21
1880	11,318,547	23
1890	18,284,385	29

The States containing the highest proportion of urban population are those of the North. More than half the population of the North Atlantic States is contained in cities of 8,000 or more inhabitants, while of the North Central States more than one-quarter are found in similar cities. Indeed, four-fifths of all the urban population of the country is found in the Northern States. In 1890 there were 28 cities containing 100,000 or more inhabitants each, and of these three—New York, Chicago, and Philadelphia—contained more than 1,000,000 inhabitants each. The following is a list of these cities, with their population:

CITIES OF OVER 100,000 POPULATION IN 1890.

New York	1,515,301	Detroit	205,876
Chicago	1,099,850	Milwaukee	204,468
Philadelphia	1,046,964	Newark	181,830
Brooklyn	806,343	Minneapolis	164,738
St. Louis	451,770	Jersey City	163,003
Boston	448,477	Louisville	161,129
Baltimore	434,439	Omaha	140,452
San Francisco	298,997	Rochester	133,896
Cincinnati	296,908	St. Paul	133,156
Cleveland	261,353	Kansas City	132,716
Buffalo	255,664	Providence	132,146
New Orleans	242,039	Denver	106,713
Pittsburg	238,617	Indianapolis	105,436
Washington	230,392	Allegheny	105,287

Size of Families.—The average number of persons to a family in 1890 was 4·93. The size of the family is diminishing slowly, but steadily, as shown by a comparison of this with the figures for previous censuses:

AVERAGE SIZE OF FAMILIES AT EACH CENSUS.

1850	5·55
1860	5·28
1870	5·09
1880	5·04
1890	4·93

The smallest families are found in the North Atlantic and Western States, and the largest in the Southern States.

Sex.—In 1890 51·21 per cent. of the population were males and 48·79 per cent. were females. In most of the Atlantic States the females exceeded the males in number, but in the remaining States males were in excess, and in the newer States of the Rocky Mountain region they were largely in excess. The general excess of males is due to immigration.

Race.—In 1890 the Negroes, including in that term all those of full or mixed blood, numbered 7,470,040, and the whites 54,983,968, the remainder of the population being made up of Chinese, Japanese, and citizen Indians. The proportion of the Negroes has steadily diminished during the century, being only about two-thirds as great in 1890 as in 1790.

WHITE AND COLORED AT EACH CENSUS.

CENSUS.	WHITE.		COLORED.*	
	Number.	Per cent.	Number.	Per cent.
1790	3,172,006	80·73	757,208	19·27
1800	4,306,446	81·13	1,002,037	18·87
1810	5,862,073	80·97	1,377,808	19·03
1820	7,862,166	81·61	1,771,656	18·39
1830	10,537,378	81·90	2,328,642	18·10
1840	14,195,805	83·17	2,873,648	16·83
1850	19,553,068	84·31	3,638,808	15·69
1860	26,922,537	85·62	4,520,784	14·38
1870	33,589,377	87·11	4,968,994	12·89
1880	43,402,970	86·54	6,752,813	13·46
1890	54,983,968	87·80	7,638,282	12·20

* Including Chinese, Japanese, and citizen Indians.

The colored were found mainly in the Southern States, seven-eighths of them living S. of Mason and Dixon's line, the Ohio river, and the southern boundary of Missouri. In these States, as a whole, they constituted nearly one-third of the entire population in 1890; in Louisiana they constituted one-half, and in Mississippi and South Carolina very nearly three-fifths. The Chinese population has remained unchanged in consequence of the enforcement of the Chinese Exclusion Act. In 1890 they numbered 107,745.

Nativity.—In 1890 there were 9,249,547 persons of foreign birth, leaving 53,372,703 natives, of whom 45,862,023 were native whites. The foreign born constituted 14·77 per cent. of the population.

The following table gives the numbers of the native, native white, and foreign-born elements since 1850, the year of the census in which statistics giving these particulars were first obtained:

NATIVITY OF THE POPULATION, 1850 TO 1890.

CENSUS.	Native.	Native white.	Foreign born.
1850	20,947,274	17,273,804	2,244,602
1860	27,304,624	22,862,794	4,138,697
1870	32,991,142	28,111,133	5,567,229
1880	40,475,840	36,895,047	6,679,943
1890	53,372,703	45,862,023	9,249,547

The following table converts the above figures into percentages of the population:

CENSUS.	Native.	Native white.	Foreign born.
1850	90·32	73·24	9·68
1860	86·84	73·46	13·16
1870	85·56	72·91	14·44
1880	86·68	73·56	13·32
1890	85·23	73·24	14·77

The source of the element of foreign birth is immigration from Europe, which has been exceedingly active for nearly half a century and particularly since 1880. Between 1880 and 1890 5,246,613 immigrants entered the U. S. The following table shows the immigration in each ten-year period since statistics were first obtained:

IMMIGRATION.

1821 to 1830	143,439
1831 to 1840	599,125
1841 to 1850	1,713,251
1851 to 1860	2,579,580
1861 to 1870	2,282,787
1871 to 1880	2,812,191
1881 to 1890	5,246,613

See IMMIGRATION and SOCIOLOGY.

The following table classifies the foreign born by the principal contributing nationalities:

FOREIGN BORN, BY PRINCIPAL NATIONALITIES, 1890.

Germany	2,784,894
Ireland	1,871,468
England, Scotland, and Wales	1,251,397
Canada and Newfoundland	980,941
Norway, Sweden, and Denmark	933,249
Russia	182,645
Italy	182,580
Poland	147,440
Austria	123,271
Bohemia	118,106
France	113,174
China	106,462
Switzerland	104,069
Hungary	62,435

This element of foreign birth is found mainly in the Northern States, only a trifling number having gone into the Southern. With the exceptions of the Norwegians and Swedes the foreign element is found principally in the cities, where it is often in far higher proportion than is the native. The number of persons whose parents were of foreign birth, including the foreign born, was 20,263,902, constituting 32 per cent. or nearly one-third of the entire population. The distribution of this class is similar to that of the foreign born,

CONSTITUENTS OF THE POPULATION OF THE GREAT CITIES.

CITIES.	Native whites of native parentage.	Native whites of foreign parentage.	Foreign born.	Colored.
Milwaukee	13	48	39	..
New York	18	38	42	2
Chicago	21	56	23	..
Detroit	21	38	40	1
San Francisco	21	27	42	10
Buffalo	22	43	35	..
St. Paul	23	36	40	1
Cleveland	24	38	37	1
Jersey City	25	40	33	2
St. Louis	26	42	26	6
Cincinnati	27	45	24	4
Brooklyn	27	41	32	..
Pittsburg	29	37	31	3
Boston	30	33	35	2
Rochester	30	40	30	..
New Orleans	30	30	14	26
Newark	31	37	30	2
Minneapolis	33	30	37	..
Allegheny	36	36	25	3
Providence	37	30	30	3
Louisville	39	29	15	17
Philadelphia	40	21	35	4
Baltimore	43	26	16	15
Washington	47	12	8	33
Omaha	49	23	25	3
Denver	51	21	24	4
Indianapolis	54	23	14	9
Kansas City	55	19	15	11

MAP SHOWING THE POSITION OF THE
CENTER OF POPULATION
AT THE CLOSE OF EACH DECADE FROM
1790 TO 1900
AND THE LOCATION OF THE
MEDIAN POINT
IN 1880, 1890 AND 1900
Center of Population
Median Point
SCALE OF MILES
10 0 10 20 30 40 50 60 70 80 90
LAKE ERIE
MICHIGAN
OHIO
INDIANA
ILLINOIS
KENTUCKY
WEST VIRGINIA
PENNSYLVANIA
MARYLAND
VIRGINIA
WASHINGTON
Chesapeake Bay
South Bend
Toledo
Cleveland
Pittsburg
Harrisburg
Wheeling
Columbus
Indianapolis
Chillicothe
Parkersburg
Clarksburg
Frederick City
Baltimore
Annapolis
Moorefield
Woodstock
Cincinnati
Charleston
Louisville
Frankfort
Richmond
Maumee River
Sciota River
Miami River
Ohio River
Kentucky River
Shenandoah River
Potomac River
Rappahannock River
James River
1790
1800
1810
1820
1830
1840
1850
1860
1870
1880
1890
1900
Longitude West from Greenwich
L.L.POATES, ENGR., N.Y.

nearly all of it being comprised in the Northern and Western States. The foreign element, including those born abroad as well as those whose parents were born abroad, is very large in the more northern States of the Mississippi valley and in certain New England States. In North Dakota only about one-fifth of the population was of native parentage, in Minnesota about one-fourth, and in Wisconsin a little more than one-fourth, while in twelve States less than half the people were of native parentage. A similar situation was developed in the great cities; the preceding table of the 28 cities which have more than 100,000 inhabitants shows the percentage of the various elements in the population of each.

Of the large foreign element of Cincinnati and Milwaukee, more than two-thirds are Germans. The Germans form a majority of the foreign element also in Louisville, Baltimore, St. Louis, Indianapolis, and Allegheny. In New York 33 per cent. of the foreign element consists of Germans and 30 per cent. of Irish. In Chicago 36 per cent. are Germans, 16 per cent. Irish, and 16 per cent. Scandinavians. In St. Paul 31 per cent. are Germans and 32 per cent. Scandinavians, and in Minneapolis 56 per cent. of the foreign born are Scandinavians.

The following table shows the population by States and Territories, and by nativity and race:

POPULATION BY NATIVITY AND RACE.

STATES AND TERRITORIES.	Total population.	White.	Colored.	Native.	Native white.	Foreign born.
Alabama	1,513,017	833,718	679,299	1,498,240	819,114	14,777
Arizona	59,620	55,580	4,040	40,825	38,117	18,795
Arkansas	1,128,179	818,752	309,427	1,113,915	804,658	14,264
California	1,208,130	1,111,672	96,458	841,821	818,119	366,309
Colorado	412,198	404,468	7,730	328,208	321,962	83,990
Connecticut	746,258	733,438	12,820	562,657	550,283	183,601
Delaware	168,493	140,066	28,427	155,332	126,970	13,161
Dist. of Columbia	230,392	154,695	75,697	211,622	136,178	18,770
Florida	391,422	224,949	166,473	368,490	206,771	22,932
Georgia	1,837,353	978,357	858,996	1,825,216	966,465	12,137
Idaho	84,385	82,018	2,367	66,929	66,554	17,456
Illinois	3,826,351	3,768,472	57,879	2,984,004	2,927,497	842,347
Indiana	2,192,404	2,146,736	45,668	2,046,199	2,000,733	146,205
Iowa	1,911,896	1,901,086	10,810	1,587,827	1,577,154	324,069
Kansas	1,427,096	1,376,553	50,543	1,279,258	1,228,923	147,838
Kentucky	1,858,635	1,590,462	268,173	1,799,279	1,531,222	59,356
Louisiana	1,118,587	558,395	560,192	1,068,840	509,555	49,747
Maine	661,086	659,263	1,823	582,125	580,568	78,961
Maryland	1,042,390	826,493	215,897	948,094	732,706	94,296
Massachusetts	2,238,943	2,215,373	23,570	1,581,806	1,561,870	657,137
Michigan	2,093,889	2,072,884	21,005	1,550,009	1,531,283	543,880
Minnesota	1,301,826	1,296,159	5,667	834,470	829,102	467,356
Mississippi	1,289,600	544,851	744,749	1,281,648	537,127	7,952
Missouri	2,679,184	2,528,458	150,726	2,444,315	2,294,176	234,869
Montana	132,159	127,271	4,888	89,063	86,941	43,096
Nebraska	1,058,910	1,046,888	12,022	856,368	844,644	202,542
Nevada	45,761	39,084	6,677	31,055	27,190	14,706
New Hampshire	376,530	375,840	690	304,190	303,644	72,340
New Jersey	1,444,933	1,396,581	48,352	1,115,908	1,068,596	328,975
New Mexico	153,593	142,719	10,874	142,334	131,859	11,259
New York	5,997,853	5,923,952	73,901	4,426,803	4,358,260	1,571,050
North Carolina	1,617,947	1,055,382	562,565	1,614,245	1,051,720	3,702
North Dakota	182,719	182,123	596	101,258	100,775	81,461
Ohio	3,672,316	3,584,805	87,511	3,213,023	3,126,252	459,293
Oklahoma	61,834	58,826	3,008	59,094	56,117	2,740
Oregon	313,767	301,758	12,009	256,450	253,936	57,317
Pennsylvania	5,258,014	5,148,257	109,757	4,412,294	4,304,668	845,720
Rhode Island	345,506	337,859	7,647	239,201	231,832	106,305
South Carolina	1,151,149	462,008	689,141	1,144,879	455,865	6,270
South Dakota	328,808	327,290	1,518	237,753	236,447	91,055
Tennessee	1,767,518	1,336,637	430,881	1,747,489	1,316,738	20,029
Texas	2,235,523	1,745,935	489,588	2,082,567	1,594,466	152,956
Utah	207,905	205,899	2,006	154,841	153,766	53,064
Vermont	332,422	331,418	1,004	288,334	287,394	44,088
Virginia	1,655,980	1,020,122	635,858	1,637,606	1,001,933	18,374
Washington	349,390	340,513	8,877	259,385	254,319	90,005
West Virginia	762,794	730,077	32,717	743,911	711,225	18,883
Wisconsin	1,685,880	1,680,473	6,407	1,167,681	1,161,484	519,199
Wyoming	60,705	59,275	1,430	45,792	44,845	14,913

Alaska, 32,052, of whom 4,298 are white.
Indian Territory, 179,321, of whom 50,055 are Indians and 109,384 are whites.

Indians.—Indians "not taxed"—i. e. in tribal relations—are excluded by the Constitution from the basis of political representation. The several tribes are regarded as domestic, dependent nations, governed by their own laws, yet subject to the sovereignty of the U. S.; having a right of occupancy in their lands, yet without the power to cede those lands except to the U. S. The policy of removing the Indians to lands W. of the Mississippi was inaugurated about 1825, and largely carried out in the twenty years following, especially with the Southern or Appalachian Indians—the Creeks, Choctaws, Chickasaws, Cherokees, and Seminoles. Besides the Indian Territory, other large reservations have been set apart for Indian occupation, especially in Montana and the Dakotas. The total area of these reservations was, in 1894, 85,580,882 acres, or 133,720 sq. miles. The total Indian population, as returned by the census of 1890, was 249,273. Of these there were on reservations and under the control of the Indian office, 133,382. The Five Civilized Tribes in the Indian Territory, who are self-supporting, numbered as follows: Cherokees, 29,590; Chickasaws, 7,182; Choctaws, 14,379; Creeks, 14,632; Seminoles, 2,561—total, 68,344, of whom 52,065 were reported as Indians, including mixed bloods, the remainder being whites who had married into the tribes or colored citizens of the tribes. The Pueblo Indians of New Mexico numbered 8,278; the Six Nations of New York, 5,304; and the Eastern Cherokees of North Carolina, 2,885. Indians who had abandoned tribal relations and established themselves among the whites numbered 32,567. See INDIANS OF NORTH AMERICA.

Mortality.—The estimated death-rate of the population is 18 per 1,000. Among persons of foreign birth the rate is greater than this, and among the colored it is much greater, being in the cities very nearly double that of the whites. The rate in the cities is naturally very much greater than that in the rural districts, especially among young children. The most prevalent and fatal diseases are in the order mentioned: Consumption, which in 1890 was the cause of 11·6 per cent. of all deaths; pneumonia, 8·8 per cent.; diarrhœal diseases, 8·5 per cent.; diphtheria and croup together, 4·8 per cent.; enteric fever, 3·1 per cent.; and malarial fever, 2·1 per cent. See also VITAL STATISTICS.

Dependents and Prisoners.—The number of insane in 1890 was 106,254, or 1,649 per 1,000,000 of inhabitants; feeble-minded, 95,571, or 1,526 per 1,000,000; deaf and dumb, 41,283 (659 per 1,000,000); blind, 50,411 (805 per 1,000,000); and prisoners, 83,329, of whom 75,924 were men and 6,405 were women. Of prisoners, 57,310 were white and 25,019 colored. Classifying them by nativity and race, and reducing the numbers to proportions of the total number of inhabitants, it appears that of white natives of native parentage 6 out of every 10,000 are prisoners; of white natives of foreign parentage, 13 out of every 10,000; of the foreign born, 17 out of every 10,000; and of the colored, 32 out of every 10,000. The number of paupers in almshouses was 73,015. Classifying these also by race and nativity, and obtaining the proportion between the number of paupers and the number of population of each race and nativity, it appears that 9 out of every 10,000 of the native whites were paupers; while the similar figures for the foreign born are 30 out of every 10,000; and of the colored, 9 out of every 10,000. The low proportion of paupers among the colored is probably due to the fact that there are few almshouses in the South.

For other statistics, see the article VITAL STATISTICS.

PUBLIC LANDS.

Accessions of Territory.—The original limits of the U. S. extended on the W. to the Mississippi river, and on the S. to the 31st parallel. From time to time accessions of territory were made, as set forth and illustrated in the following map and table (see UNITED STATES in the Appendix):

AREA OF ACQUIRED TERRITORY.

DATE.	Source.	Area, sq. miles.
1803	Louisiana purchase	1,171,931
1821	Florida purchase	59,268
1845	Annexation of Texas	375,239
1848	Mexican cession	545,783
1853	Gadsden purchase	45,535
1867	Purchase of Alaska	570,000

Of the original territory much was unsettled, and was claimed by certain of the original States, their claims overlapping one another in a perplexing manner. As a simple method of settling these conflicting claims, these States ceded them to the U. S., and thus the U. S. became a large landowner. Each addition of territory has added to the Government's land holdings, with the exception of Texas.

(1) *Methods of Subdivision.*—In order to subdivide the lands into parcels convenient for disposal, they have been cut up into townships, sections, and quarter-sections, under a uniform system—a section comprising a square mile and a township 36 sq. miles. The method of survey is as follows: Starting from an initial point, selected arbitrarily, an east and west line, known as a base line, and a north and south line, known as a principal meridian, are run through it. At intervals of 24 miles on the principal meridian, lines are run east and west. These are known as standard parallels, or correction lines. At similar intervals of 24 miles on the base line, and on these standard parallels, lines are run N. 24 miles, to the next standard parallel. In this way the land is divided into tracts approximately 24 miles on a side. On account of the convergence of meridians, the tracts are not exact squares, but are narrower at the N. than at the S. These tracts are then divided into townships by lines following meridians and parallels, and the townships are divided into sections in a similar manner. The ranges, as the north and south tiers of townships are termed, are numbered E. and W. of the principal meridian, and the townships are numbered N. or S. of the base line. The sections are numbered within each township, beginning with the northeasternmost, running thence westward to the west line, the northwestern one being numbered 6, while that S. of it is 7, and thence the numbers increase to the E., then to the W. again, etc. For example, the southwest section of a township may be designated as Sec. 31, Twp. 4 N., R. 15 W. of the 6th Principal Meridian.

(2) *Methods of Disposal.*—The policy of the U. S. in disposing of its public lands has been to use them to aid in the extension of settlements and the development of its domain rather than for purposes of profit. Accordingly, liberal homestead and pre-emption laws (see HOMESTEAD LAWS) have been enacted, by which actual settlers can obtain land for little more than the cost of surveying it; grants have been made to railways to enable them to extend their lines into unsettled regions; and donations have been made for educational purposes. Apart from special grants, the public lands have been acquired by individuals in the following ways: (1) Under the Homestead Act, by which a tract of 80 acres at $2.50 an acre (called double minimum land), or 160 acres at $1.25, may be obtained through the payment of certain fees and commissions, ranging from $7 to $34, on condition that the applicant resides on and cultivates the land for five years; (2) under the Pre-emption Act, through which a person may, by entering at the appropriate land office a tract of 80 or 160 acres, secure a right to take the land at Government rates whenever it may be offered for sale (repealed in 1891); (3) by auction, whenever offered by proclamation of the President or by public notice from the general land office at Washington; (4) after a failure to sell by auction, the lands remain subject to purchase by what is called private entry at any subsequent period; (5) by timber-culture, or planting trees on 10 acres, one may obtain a patent for 160 acres free, at the end of three years (repealed in 1891); (6) by providing means of irrigation, settlers may take up a full section, 640 acres, of desert land.

Excluding Alaska, the entire area of the public lands may be estimated at 1,440,000,000 acres. Of this area the U. S. had, to July 1, 1894, disposed of 895,000,000 acres, leaving 545,000,000 acres still in its possession. The following table shows the principal items of disposition:

DISPOSITION OF PUBLIC LANDS.

	Acres.
Homesteads	147,000,000
Cash sales	224,000,000
Railway land grants patented	80,000,000
Swamp lands to States	70,000,000
Land bounties for military services	61,000,000

Of the remainder, a large part, say one-sixth, consists of Indian reservations; another large part, perhaps an equal proportion, has been granted to railways, but is not yet patented, since the conditions under which the grants were made have not been fulfilled; and a third large part, which it is impossible to estimate, has been filed on by settlers, but title has not yet passed.

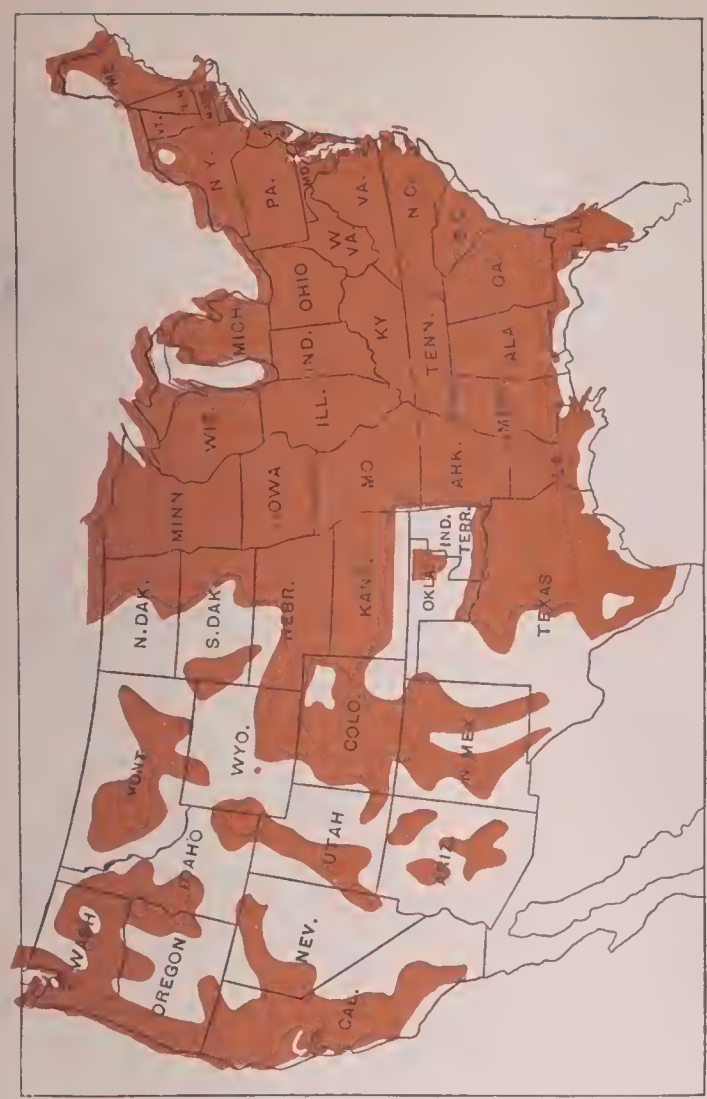
PUBLIC IMPROVEMENTS.

In the early part of the nineteenth century public improvements were made by the individual States. During this period many great works were undertaken and carried through by them. Among these is the Erie Canal, built by the State of New York, which is still one of the most important factors in transportation from the West, notwithstanding the development of railways. A number of canals were also built by Pennsylvania, Virginia, Ohio, and Indiana, but most of them are now merely matters of history. After 1820, or thereabouts, the general Government undertook public improvements, and constructed several wagon-roads, among them the great Cumberland road across the Appalachian Mountains. In 1850 it inaugurated a policy, since carried out on a large scale, of aiding in the construction of railways by grants of lands. The first railway to be so aided was the Illinois Central in Illinois. At first grants were made to the railways through the medium of the States; subsequently, however, the grants were made directly to the corporations. By these grants the construction of many of the roads of the far West was made possible. The lands were granted in alternate sections for a certain breadth on each side of the road, the Government retaining the other sections. As it often happened that certain lands within these belts had already passed into other ownership, indemnity strips were added outside of the grant—strips from which the companies could select land to indemnify themselves for such sections of the grant as had already passed from Government ownership. The price of the Government sections within the grant limits was immediately doubled, so that while the Government encouraged the building of railways by granting lands, it suffered no loss, the increased price being easily obtained on account of the facilities afforded by the railway for transportation. This policy of the Government has resulted in great good to the country by inducing rapid settlement. The total amount of land which had been so patented to railways in 1894 was 80,000,000 acres. In addition to these land grants, States and municipalities have made large subsidies to railways, usually in the form of subscriptions, either to bonds or to capital stock. In 1870 the general Government began making direct appropriations for river and harbor improvements in aid of navigation. The appropriation amounted in that year to the modest sum of $2,000,000, but it increased, with a few setbacks, until in 1890 it was in excess of $25,000,000. While these appropriations are in many instances unwise and the money is used in a wasteful manner, both upon unworthy objects and under bad plans, still many useful results have been attained; the navigation of the great rivers, the Ohio, Mississippi, and Missouri, has been greatly improved; the construction of the jetty system at the mouth of the Mississippi river has made New Orleans an important port and has given it an immense commerce; the construction of the canal at Sault St. Marie has connected the navigation of Lake Superior with that of the lower lakes; the entrances to many harbors have been deepened, and the shelter which they afforded has been improved by means of breakwaters. The U. S. maintains an admirable system of coast lighting, for details of which see LIGHTHOUSE. It also maintains an efficient life-saving service upon its coasts. See LIFE-SAVING SERVICE.

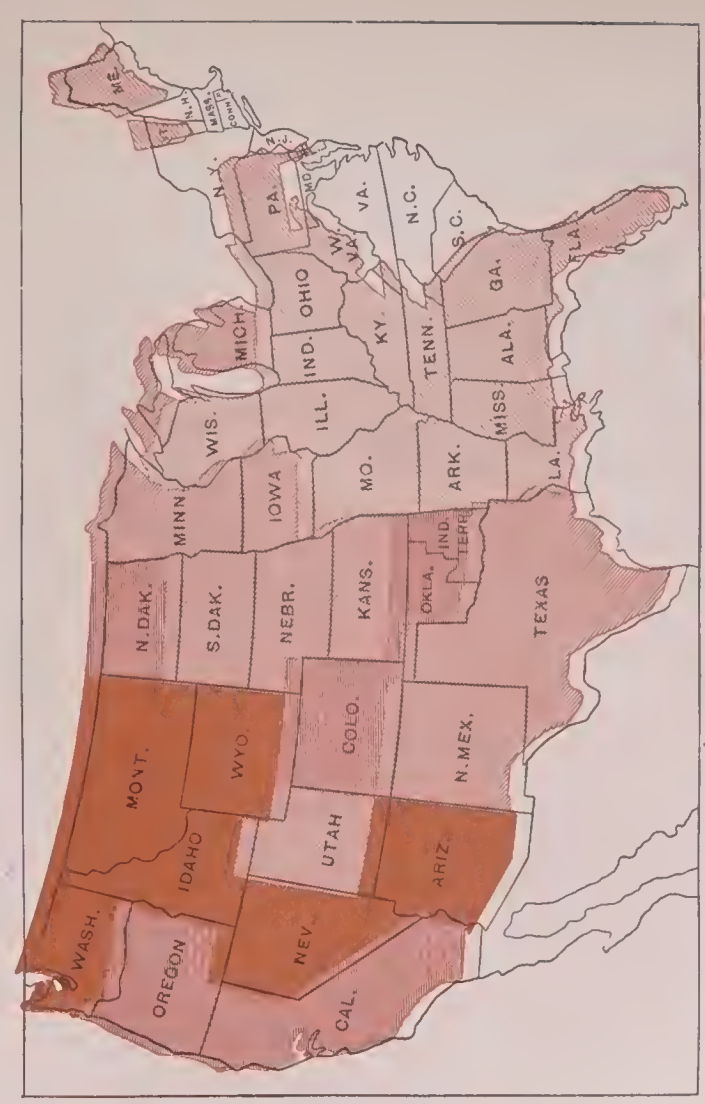
MEANS OF COMMUNICATION.

Railways.—At the close of 1899 there were in operation 187,781 miles of railway, the capital stock of which was $5,742,181,181; funded debt, $5,644,858,027; and floating debt, $305,777,858. The total liabilities therefore, which may be regarded as representing the cost of the roads, are $12,165,327,849. The average cost per mile for construction was $54,607.48; the gross earnings, $1,336,096,379, or 13.03 per cent. the cost of construction; the net earnings were $447,741,014; and the dividends paid during the year $109,032,252, which is 1.93 per cent. of the stock. The average rate of interest paid on the bonds and floating debt was 4.02 per cent. The number of passengers carried 1 mile was 14,859,541,965; average receipts per passenger per mile, 2.003 cents; amount of freight carried 1 mile, 126,991,703,110 tons; average receipts per ton per mile for freight, 0.72 cents. See RAILWAYS, TUNNELS, etc.

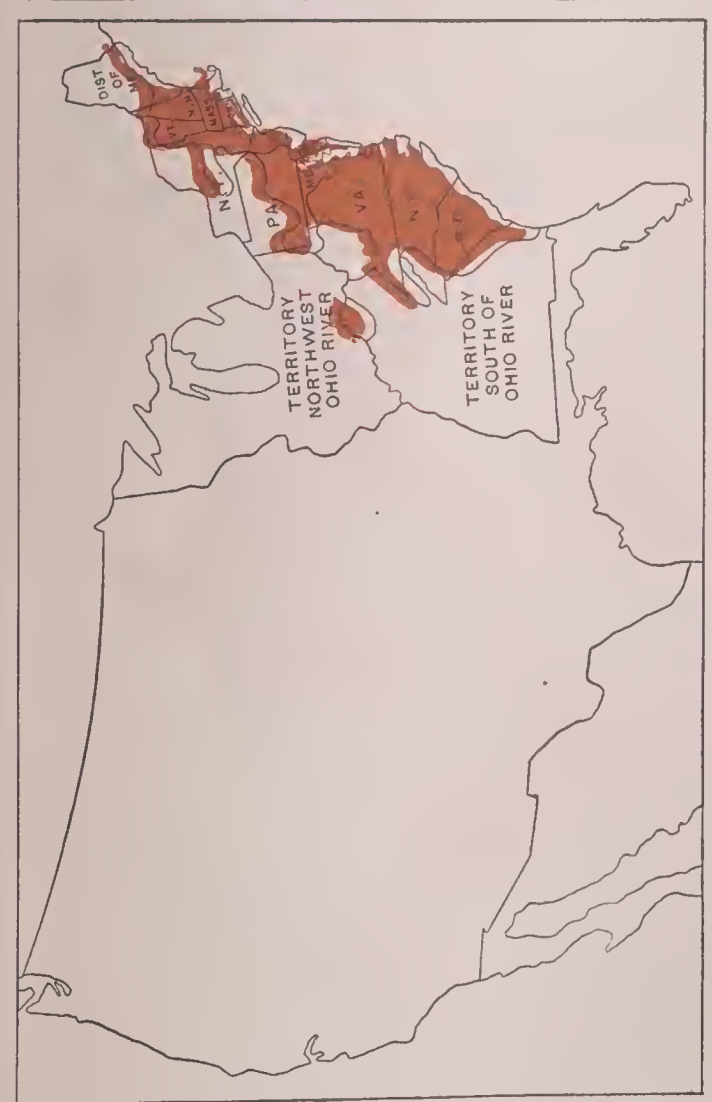
Rivers.—The rivers furnish a system of internal navigation of the highest importance. The system of the St. Lawrence river and the Great Lakes provides, with the aid of two canals, access from the ocean to the head of Lakes Superior and Michigan, in the heart of the continent, and



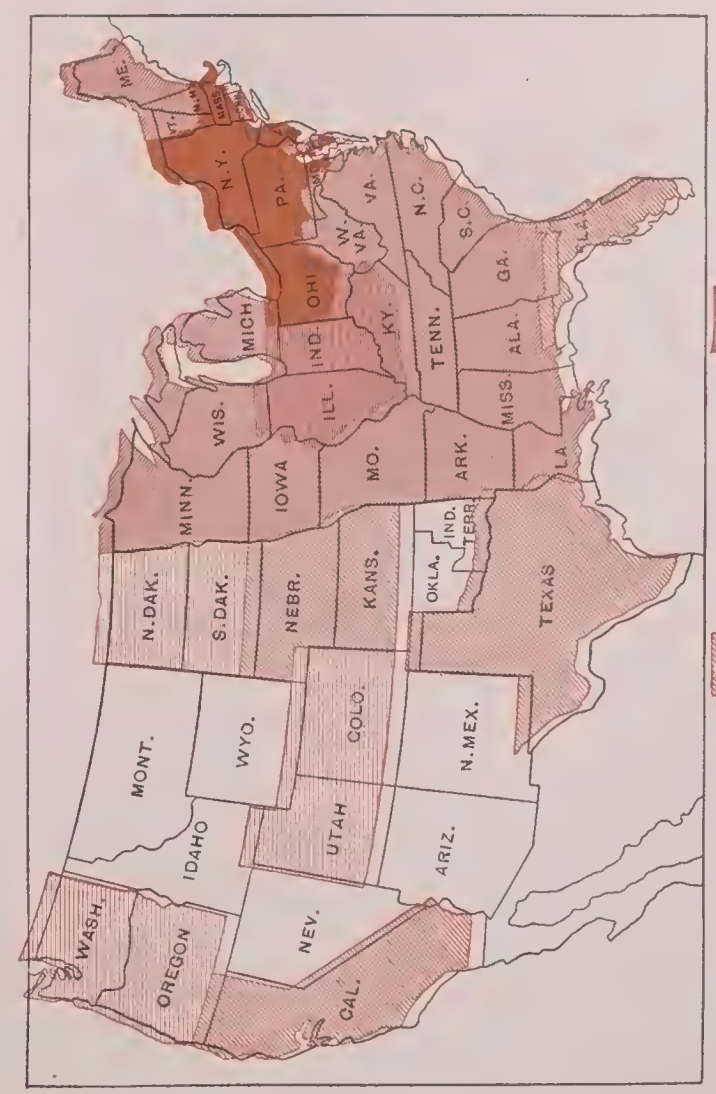
Settled area in 1890.



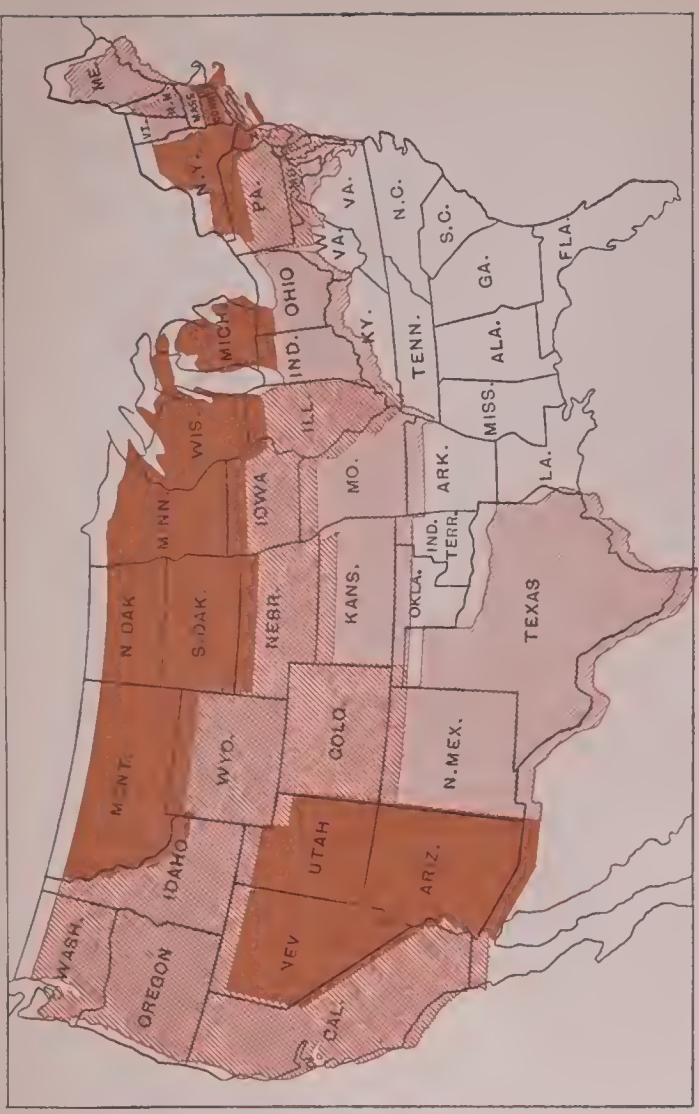
Distribution of population by sex (1890).



Settled area in 1790.



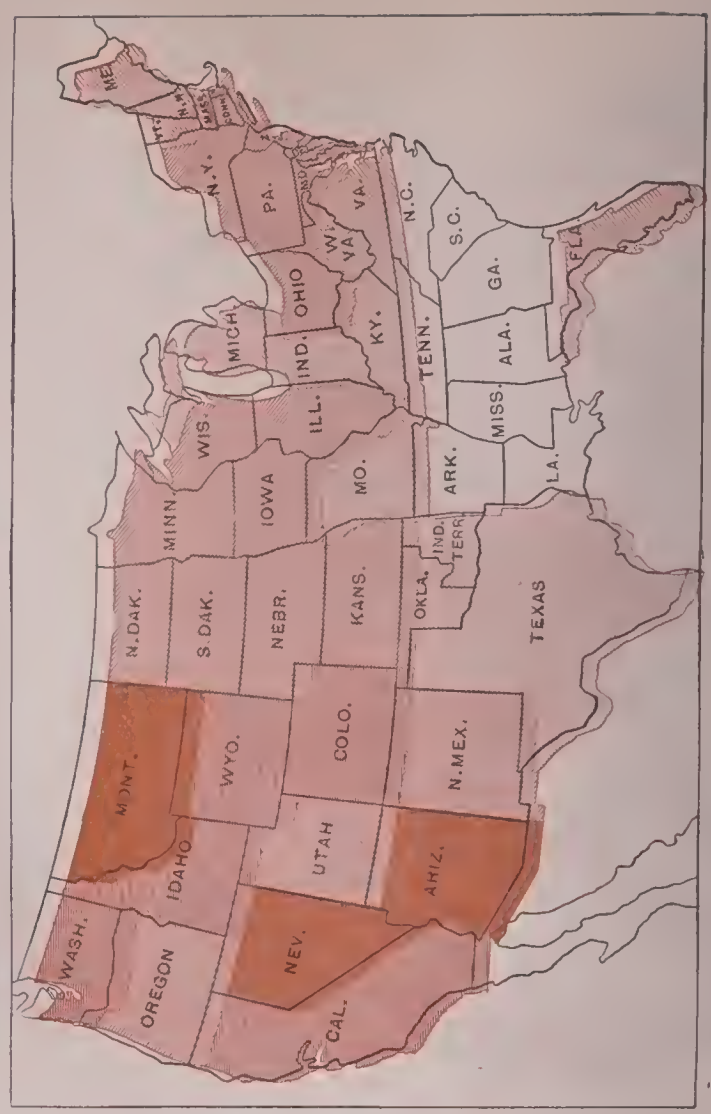
Density of population (1890).



LESS THAN 5 PER CENT — 15-25 PER CENT

MORE THAN 25 "

Proportion of foreign-born to total population (1890).

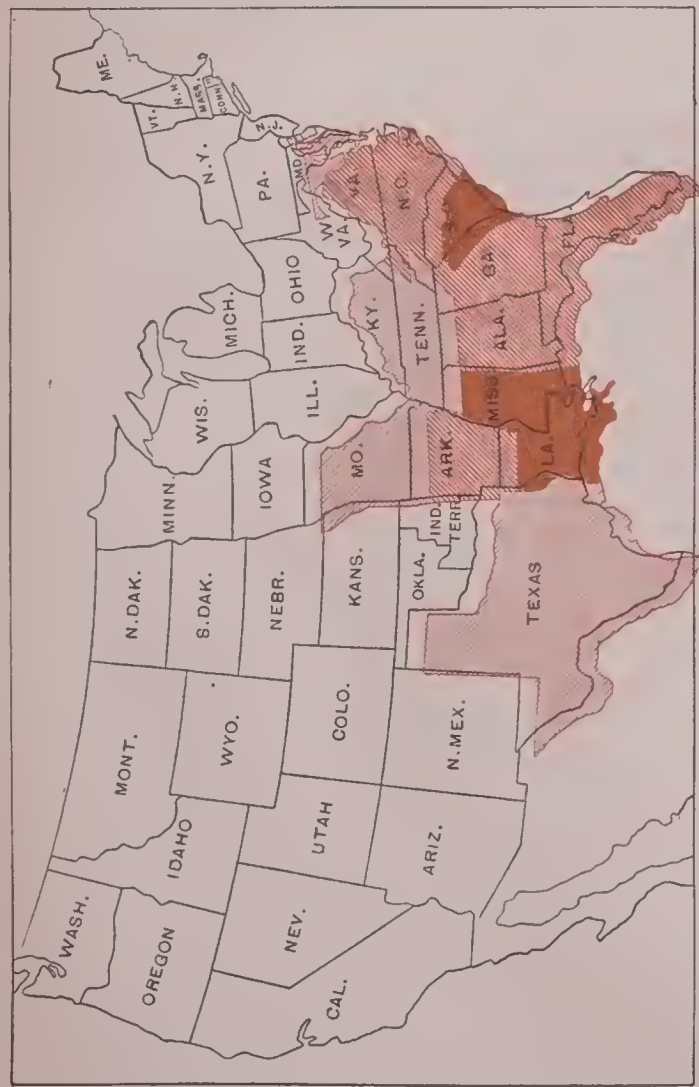


LESS THAN $500 — 2000-3000

500-1000 — OVER 3000

1000-2000

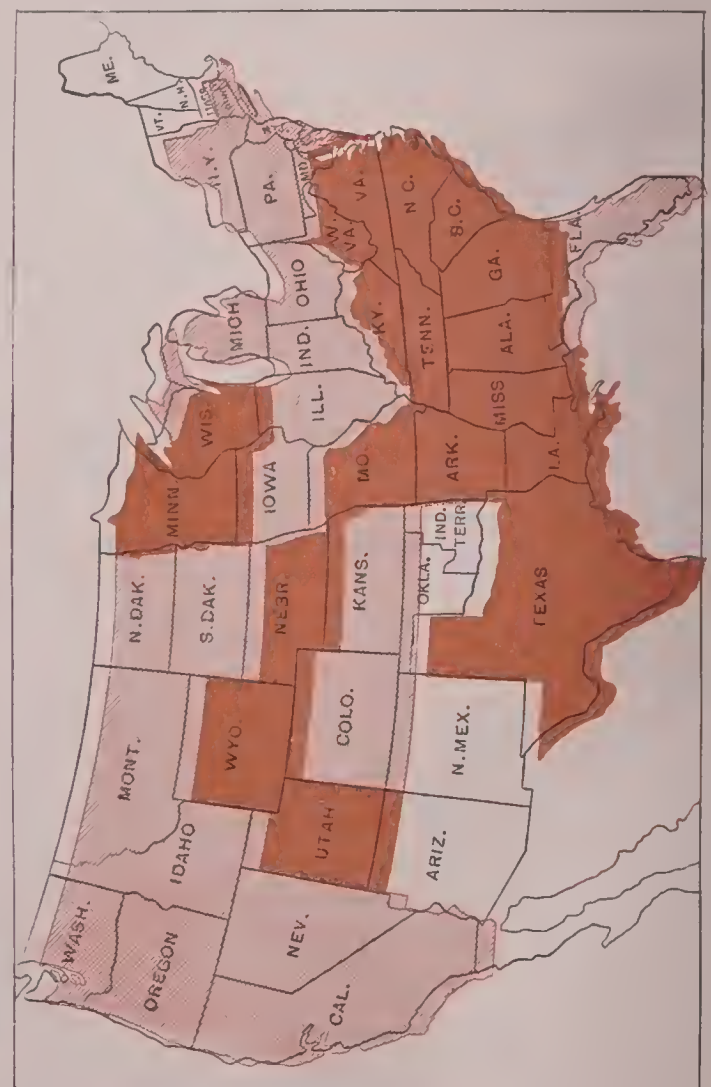
Wealth (in dollars) per capita of the population (1890).



LESS THAN 5 PER CENT — 25-50 PER CENT

5-25 — ABOVE 50

Proportion of colored persons to total population (1890).



LESS THAN 4½ PERSONS TO A FAMILY — 4½-5 PERSONS TO A FAMILY

5 OR MORE PERSONS TO A FAMILY

Average size of families (1890).

this is utilized yearly by nearly 1,000,000 tons of shipping. The rivers of the Atlantic Plain have but short navigable courses, ranging from 100 to 200 miles in length, as their navigability is stopped at the fall line. The Mississippi is the greatest artery of the country. The main stream is navigable, by the aid of a canal at Rock Island, Ill., to the Falls of St. Anthony at Minneapolis; the Ohio is navigable to Pittsburg; the Missouri at high water to Great Falls, Mont.; the Arkansas to Fort Smith, Ark.; the Red river to Shreveport, La. Besides these, many other branches of the great river are navigable for considerable distances, making it possible for river traffic to compete with railway transportation over a large part of the Mississippi valley.

Canals.—Prior to the construction of railways, many canals were built in the Eastern States, in part at State expense and in part by private corporations. The advent of the railway checked their construction, and has since induced the discontinuance of fully half of them. In 1890 the total mileage of canals in operation was 2,704, of which 2,598 miles were canals proper, and 106 miles slackwater navigation. The tonnage which passed through them in that year is given as 21,046,857. The gross income of the canals was $3,900,000, and the expense of maintenance $2,070,589, leaving a profit of $1,829,425. See CANALS and articles on individual canals, such as the ERIE, ILLINOIS AND MICHIGAN, JAMES RIVER AND KANAWHA.

Postal Service.—The statistics of postal service for 1900 are as follows: Total number of post-offices, 76,688 (4,280 presidential and 72,408 fourth-class); extent of post routes, 500,982 miles, of which 169,768 was railway routes; revenue of the department, $102,354,579; expenditure, $107,740,268; deficit, $5,385,689. See POSTAL SERVICE.

Telegraphs and Telephones.—The telegraph system is almost entirely in the hands of a single corporation, the Western Union Telegraph Company, which in 1900 had 22,900 offices, operated 192,705 miles of line, over which were strung 933,153 miles of wire, sent over 63,167,783 messages, and had receipts of $24,758,569.55 and expenditures of $18,593,205.87. (See TELEGRAPH.) The telephone business is almost entirely in the hands of a single company, which in 1900 had 1,239 exchanges and 1,580,101 rented instruments, operated 1,016,777 miles of local and 150,380 miles of long-distance wire, and reported more than 1,666,000,000 exchanges. See TELEPHONE.

INDUSTRIES.

Agriculture.—The latest statistics of agriculture which are reliable are from the U. S. census of 1890, and concern the crops of the preceding year. Up to and including the census of 1880 agriculture was in all respects the leading industry of the country. Returns from the census of 1890 indicate that while it was still the leading industry as regards the number of persons engaged in and supported by it, it had become secondary to manufactures in respect to the value of the product. Probably two-fifths of those engaged in profitable occupations among the population were engaged in agriculture, and a corresponding proportion of the total population were supported thereby. The value of agricultural products in 1890 was returned as $2,460,000,000, the increase over corresponding figures for 1880 being at the rate of 11 per cent., a rate of increase very much less than that of the population. The estimated net value of manufactures in 1890 was a trifle over $4,000,000,000, and the rate of increase in the value of the net product in the ten years preceding was slightly in excess of 100 per cent., a rate very much greater than that of the population. These facts indicate that the increase in population between 1880 and 1890 went in great measure to manufacturing industries rather than to those of agriculture. In 1890 the number of farms was 4,565,000, the rate of increase during the ten years preceding being but 14 per cent. The value of farms in 1890 was $13,276,000,000; the rate of increase in the ten years preceding was 30 per cent., a rate greater than that of the number of farms and indicating an increased value per farm. Farming tools and machinery were valued at $494,000,000. From 1850 to 1880 the average size of farms diminished from 203 to 134 acres. The census of 1890 showed a slight increase, the average size being 137 acres. The extent of improved or cultivated land in 1890 was 358,000,000 acres, or about 560,000 sq. miles, being about 18 per cent. of the area of the country, excluding Alaska. The proportion of cultivated land in the different States ranges very widely. It is highest in the States of Illinois and Iowa, where nearly three-fourths of the total area is cultivated, while in Ohio more than two-thirds and in Indiana three-fifths is under cultivation. In Southern New England about one-half the area is cultivated. In the Southern States the proportion is about one-quarter of the total area, and in many of the States of the Cordilleran region less than 1 per cent. is as yet under cultivation.

The cotton crop is one of the most important, and as an export crop the most important, of all the products of agriculture. The crop of 1899, as appears from the estimates of the Agricultural Department, was the largest ever raised, comprising 11,189,205 bales, and that of 1900 was 9,142,838 bales. The crop of 1889, as shown by the census returns, was 7,434,687 bales. Cotton is produced mainly in the South Atlantic States S. of Virginia and in those bordering on the Gulf of Mexico, together with Arkansas. The following table shows the product by States in 1900:

YIELD OF COTTON IN 1900, BY STATES.

State.	Bales.
Texas	2,438,555
Georgia	1,345,699
Mississippi	1,203,739
Alabama	1,005,313
South Carolina	830,714
Louisiana	699,476
Arkansas	669,385
North Carolina	503,825
Tennessee	192,263
Indian Territory	119,939
Oklahoma, Florida, Missouri, Virginia, Kansas, Utah, and Kentucky	133,930

About two-thirds of the cotton crop is exported, mainly to Great Britain, and most of the remainder is manufactured in New England. (See COTTON.) The wheat crop in 1900 was, according to the estimates of the Department of Agriculture, 522,229,505 bush.; in 1898, by the same authority, 675,149,000, the largest ever produced; and in 1889, by the census returns, 468,000,000. This crop is produced mainly in the Northern States of the Mississippi valley. One-third to one-fourth of the crop is annually exported. (See WHEAT.) Indian corn or maize is cultivated to an enormous extent and over a wide area, extending from the southern to the northern limits of the country. The greater proportion of the crop, however, is produced in the Middle States of the Mississippi valley, from Kentucky and Ohio westward to Kansas and Nebraska. The largest crop ever produced was that of 1896, which amounted to 2,283,875,165 bush. In 1900 the estimates of the Department of Agriculture reported a crop of 2,105,102,516 bush. (See MAIZE.) Oats is a crop of great importance, and its cultivation is rapidly increasing. It is produced mainly in the Northern States of the Mississippi valley and about the Great Lakes. The product of 1895 was 824,443,537 bush. Since then it has fluctuated in different years, being in 1900, according to the estimates of the Department of Agriculture, 809,125,989 bush. (See OAT.) The product of rye in 1900 was 23,995,927 bush.; of barley 58,925,833; and of buckwheat 9,566,966. These are hardy crops and are produced mainly in the Northern States. The tobacco crop of 1898 was 698,418,146 lb.; in 1889, 488,000,000. Nearly half of it was produced in Kentucky, and this State, with Virginia, Ohio, North Carolina, Tennessee, and Pennsylvania, produced over 400,000,000 lb. It was raised to a greater or less extent in 42 of the States and Territories. (See TOBACCO.) The hay crop is one of the most valuable. See HAY.

The number of farm animals in 1899 was as follows:

Horses	13,537,524
Mules	2,086,027
Cows	16,292,360
Other cattle	27,610,054
Sheep	41,883,065
Swine (1898)	38,651,631

The value of live stock, exclusive of swine, was estimated at $2,042,650,813. See CATTLE, SHEEP, SWINE, etc.

The wool clip was estimated in 1900 at 288,636,621 lb. The sugar product was as follows, in millions of pounds:

Cane	334·5
Sorghum	0·6
Beet	159·9
Maple	10·0

See SUGAR.

Irrigation.—In the States and Territories of the Cordilleran region, with the exception of the northwestern part of California, Western Oregon, and Washington, irrigation is necessary for the successful prosecution of agriculture, owing to insufficient rainfall. This area includes about 1,250,000 sq. miles, or two-fifths of the total area of the country, excluding Alaska. The full utilization of the water resources of this region may possibly result in the reclamation

of one-tenth of this area. In 1890, however, only about one-half of 1 per cent. of the entire area had been thus reclaimed. See IRRIGATION.

Manufactures.—Manufactures, in respect to the value of products, constitute the leading industry of the U. S., and their importance is increasing more rapidly than that of agriculture. In 1890 the census returns showed that the number of manufacturing establishments having an annual product of more than $500 each numbered 355,415; the capital employed in these establishments was $6.139,000,000; the number of employees was 4,712,622; and the total expenditure in wages was $2,283,000,000, an average to the employee of $485, which may be assumed as the average yearly wage. The cost of the material used was $5,162,000,000, and the gross value of the product $9,372,000,000, showing a net product, after deducting the materials used, of $4,210,000,000. All these figures show an enormous increase since 1880. The number of establishments increased 40 per cent.; capital, 121 per cent., showing a great increase in the average capital per establishment, and a consequent centralization of industries; wages, 131 per cent., being at a greater rate than the increase of capital; cost of material, 48 per cent.; and the value of products, 69 per cent. The manufacturing section is situated mainly in the North Atlantic States, spreading with diminishing importance westward, following closely the distribution of the urban population. About half of the manufactured product of 1890 came from the nine States included in the North Atlantic group, and about one-third from the North Central States. These two groups of States together produced fully 83 per cent. of all the manufactured product of the country. The principal branches of manufacture, as measured by the value of product in 1890, are set forth in the following table, which includes all those whose product exceeds $50,000,000:

VALUE OF MANUFACTURED PRODUCTS.

Agricultural implements	$81,000,000
Blacksmithing and wheelwrighting	54,000,000
Boots and shoes	256,000,000
Bakeries	128,000,000
Brick and tile manufactures	68,000,000
Butter and cheese	63,000,000
Carpentering	281,000,000
Carpets	50,000,000
Carriages and wagons	115,000,000
Cars, construction and repair	206,000,000
Chemicals	59,000,000
Clothing	503,000,000
Coffee and spice, roasting and grinding	75,000,000
Confectionery	56,000,000
Cotton goods	268,000,000
Flouring and grist mills	514,000,000
Foundries and machine-shops	413,000,000
Furniture	119,000,000
Glass	57,000,000
Hosiery and knit goods	67,000,000
Iron and steel	562,000,000
Leather	171,000,000
Liquors	290,000,000
Lumber products	587,000,000
Masonry, brick and stone	204,000,000
Painting and paper-hanging	74,000,000
Paper	74,000,000
Petroleum-refining	85,000,000
Plumbing and gasfitting	81,000,000
Printing and publishing	275,000,000
Silk manufactures	87,000,000
Slaughtering and meat-packing	565,000,000
Sugar-refining	123,000,000
Tin, copper, and sheet-iron working	67,000,000
Tobacco manufactures	195,000,000
Woolen goods	139,000,000
Worsted goods	79,000,000

See the articles FACTORIES AND FACTORY SYSTEM, STRIKES AND LOCKOUTS, COTTON MANUFACTURES, etc.

Patents.—In its patent system the U. S. is far in advance of any other country. During the year 1900 26,499 patents were issued. See PATENTS.

METALLIC PRODUCTS.

PRODUCTS.	Quantity.	Value.
Pig iron, long tons	13,620,703	$245,172,654
Silver, troy ounces	54,764,500	70,806,626
Gold, troy ounces	3,437,210	71,053,400
Copper, pounds	585,342,124	104,190,898
Lead, short tons	209,240	18,831,600
Zinc, short tons	119,408	13,731,920
Quicksilver, flasks	30,454	1,452,745
Aluminium, pounds	5,200 000	1,716,000
Antimony, short tons	1,275	251,875
Nickel, pounds	22,541	8,566
Platinum, troy ounces	300	1,800
Total value of metallic products	.....	$527,218,084

NON-METALLIC MINERAL PRODUCTS.

PRODUCTS.	Quantity.	Value.
Bituminous coal, short tons	193,321,987	$167,935,304
Pennsylvania anthracite, long tons	53,944,647	88,142,130
Lime, barrels	58,000,000	35,960,000
Building-stone	.....	33,865,573
Petroleum, barrels	57,070,850	64,603,904
Natural gas	.....	20,024,873
Clay	.....	12,500,000
Cement, barrels	14,311,407	14,417,058
Mineral waters, gallons sold	39,562,136	6,948,030
Phosphate rock, long tons	1,515,702	5,084,076
Salt, barrels	18,356,503	7,509,184
Limestone for iron flux, long tons	6,707,435	4,695,205
Zinc white, short tons	40,146	3,211,680
Potter's clay, long tons	400,000	900,000
Gypsum, short tons	479,235	1,287,080
Borax, pounds	40,714,000	1,139,882
Mineral paints, short tons	63,111	728,389
Fibrous talc, short tons	54,655	438,150
Asphaltum, short tons	75,085	553,904
Pyrites, long tons	174,734	543,249
Precious stones	.....	185,770
Soapstone, short tons	24,765	330,805
Corundum, short tons	4,900	150,600
Novaculite, pounds	.....	135,173
Bromine, pounds	433,004	108,251
Mica, pounds	3,118,570	101,465
Barytes, short tons	41,894	139,528
Fluorspar, short tons	15,900	96,650
Feldspar, long tons	27,202	228,545
Manganese ore, long tons	9,935	82,278
Flint, long tons	37,852	231,345
Graphite, pounds	7,548,732	167,106
Sulphur, short tons	4,830	107,500
Marls, short tons	60,000	30,000
Infusorial earth, short tons	4,634	37,032
Chromic iron ore, long tons	.....	.....
Millstones	.....	28,115
Cobalt oxide, pounds	10,230	18,512
Magnesite, short tons	1,280	18,480
Asbestos, short tons	681	11,740
Total value of non-metallic mineral products	.....	$447,790,862
Total value of metallic products	.....	527,218,084
Estimated value of mineral products unspecified	.....	1,000,000
Grand total	.....	$976,008,946

Mineral Production.—The preceding tables give the quantities and values of the metallic and non-metallic mineral products of the U. S. for the calendar year 1899 as estimated by the U. S. Geological Survey. For details regarding the distribution of the leading mineral products, see articles under their several heads.

Fisheries.—The fisheries of the U. S. form an important industry; in 1899–1900 the exports alone amounted to $6,326,620, and the total value is more than $40,000,000. Nearly three-fourths of this comes from the Atlantic States, over 5 per cent. each from the Gulf States and from the Great Lakes, and nearly 15 per cent. from the Pacific States. In the last-named the salmon is the most important fish taken. See also the articles FISHERIES and FISHERY RELATIONS OF THE UNITED STATES.

COMMERCE.

The commerce of the U. S. is of enormous proportions, but by far the greater part of it is internal, consisting of an interchange of commodities from one part of the country to another. It is estimated that its internal trade is twenty-four times as great in volume as its external trade, and in value ten times as great. In 1899–1900 the domestic exports had a value of $1,370,763,571, and the total exports $1,394,483,082; the imports a value of $849,941,184. The principal items of export were raw material, consisting principally of agricultural and mineral products, as follows;

Article.	Value.
Cotton, and manufactures of	$266,992,065
Breadstuffs	262,744,078
Meat and dairy products	184,453,055
Iron and steel, and manufactures of	121,992,590
Petroleum and products	75,611,750

The following are the principal items of import:

Article.	Value.
Sugar	$100,250,974
Coffee	52,467,943
Cotton manufactures	41,296,239
Silk goods	30,894,373
Manufactures of iron and steel	20,478,723
Woolen goods	16,164,446
Tea	10,558,110

See COMMERCE and INTERSTATE COMMERCE.

Shipping.—In 1890 the amount of shipping which sailed under the U. S. flag was 7,633,676 tons, including that

engaged in foreign trade and in domestic trade on the sea-coast and Great Lakes, and on the rivers. Classified as above the tonnage was:

Vessels.	Tons.
Engaged in foreign trade	928,062
Coastwise trade	2,385,879
Lake trade	926,355
River traffic	3,393,380

In other words, only about one-eighth of the shipping was engaged in foreign traffic, the remaining seven-eighths being engaged in domestic trade, while fully two-fifths of the whole amount was engaged on the navigable rivers. The shipping may also be classified as follows:

Vessels.	Tons.
Steam-vessels	1,820,386
Sailing vessels	1,795,443
Unrigged vessels	4,017,847

This large class of unrigged vessels consists mainly of barges, largely employed upon the great navigable rivers, where a number of them are towed by tugs as a locomotive draws a train of freight-cars. They are of considerable capacity, averaging 500 tons each. The amount of freight moved by water in 1890 was 172,110,423 tons; the average length of journey is unknown, and therefore these figures can not be compared with transportation by rail, but it is probable that, measured in tonnage, water transportation is in volume about one-fourth that by rail, while measured by values it is doubtless much less, inasmuch as articles conveyed by water are commonly bulky and less costly.

Ship-building.—The statistics of ship-building for 1900 show that the total number constructed was 1,447, with a tonnage of 393,790, classified as follows:

Sailing vessels:	
Ships and barks	4
Schooners	281
Sloops, canal-boats, and barges	740
Steam-vessels	422
Total	1,447

Of the above, 90 vessels, with a tonnage of 196,851, were built of iron, the remainder being of wood. See SHIP-BUILDING.

Banks.—The number of national banks Sept. 5, 1900, was 3,871; their net earnings were $87,276,836.60, and dividends $48,033,094.39, being 3·9 per cent. of the capital stock. The following table sets forth the liabilities and assets of national banks in 1900:

LIABILITIES.

Capital	$630,299,030.72
Surplus	261,874,067.84
Undivided profits	127,594,908.82
Circulation	283,948,631.50
Deposits	2,602,066,546.47
Due to banks	1,069,356,871.69
Other liabilities	72,998,442.25
Total	$5,048,138,499.29

ASSETS.

Loans	$2,686,759,642.57
Bonds for circulation	294,890,130.00
Other U. S. bonds	113,859,250.00
Stocks, bonds, etc	367,255,545.79
Due from banks	736,360,683.42
Real estate, fixtures, etc	107,231,602.47
Specie	373,328,410.71
Legal-tender notes	145,046,493.00
National bank-notes	25,416,666.00
Clearing-house exchanges	124,517,116.87
U. S. certificates of deposit	2,085,000.00
Due from U. S. treasurer	1,620,093.71
Other resources	69,767,864.75
Total	$5,048,138,499.29

The savings-banks numbered 1,002; had deposits amounting to $2,384,770,849, and surplus of $184,919,263; undivided profits $21,879,492, and other liabilities $33,304,030. There are also numerous banks in each State, operating under State charters or acts of incorporation, which report to the State authorities only. See BANK and SAVINGS-BANKS. See also articles on BUILDING AND LOAN ASSOCIATIONS, CLEARING-HOUSE, FIRE-INSURANCE, LIFE-INSURANCE, etc.

GOVERNMENT.

The Government is based on the Constitution of Sept. 17, 1787, and amendments made thereto in the years 1791, 1798, 1804, 1865, 1868, and 1870. The electors of the most numerous branch of the several State legislatures are qualified voters either directly or indirectly in the States respectively for all elective officers of the Federal Government. All legislative powers are vested in a Congress, which consists of a Senate of two members from each State, elected by the Legislature thereof for six years, and a House of Representatives, the members of which are apportioned according to population, and elected by the people directly in districts for two years. Each State is entitled to at least one representative. The Constitution provided for a specific number of Representatives to the first Congress, but afterward the number was designated by a vote of Congress itself after each decennial census. Besides its ordinary legislative capacity, the Senate is vested with certain judicial functions, and its members constitute a high court of impeachment. No person can be convicted by this court unless on the concurrence of two-thirds of the Senators present, nor does judgment extend further than to removal from office and disqualification to hold a federal office thereafter. The House of Representatives has the sole power of impeachment. The executive power is vested in a President, who is elected by an electoral college chosen by popular vote, or by the legislatures of the States, the number of electors from each State being equal to the number of its Senators and Representatives in Congress. His term of office is four years, and he is eligible for re-election, but custom has pronounced against a third term. The electors forming the college are themselves chosen in the manner prescribed by

PRESIDENTS AND VICE-PRESIDENTS.

Term.	Presidents.	Vice-Presidents.	Held office.
1	George Washington, Virginia	John Adams, Massachusetts	Apr. 30, 1789, to Mar. 4, 1793
2	George Washington, Virginia	John Adams, Massachusetts	Mar. 4, 1793, to " 1797
3	John Adams, Massachusetts	Thomas Jefferson, Virginia	" 1797, to " 1801
4	Thomas Jefferson, Virginia	Aaron Burr, New York	" 1801, to " 1805
5	Thomas Jefferson, Virginia	George Clinton, New York	" 1805, to " 1809
6	James Madison, Virginia	George Clinton, New York	" 1809, to " 1813
7	James Madison, Virginia	Elbridge Gerry, Massachusetts	" 1813, to " 1817
8	James Monroe, Virginia	Daniel D. Tompkins, New York	" 1817, to " 1821
9	James Monroe, Virginia	Daniel D. Tompkins, New York	" 1821, to " 1825
10	John Quincy Adams, Massachusetts	John C. Calhoun, South Carolina	" 1825, to " 1829
11	Andrew Jackson, Tennessee	John C. Calhoun, South Carolina	" 1829, to " 1833
12	Andrew Jackson, Tennessee	Martin Van Buren, New York	" 1833, to " 1837
13	Martin Van Buren, New York	Richard M. Johnson, Kentucky	" 1837, to " 1841
14	William Henry Harrison, Ohio	John Tyler, Virginia	" 1841, to Apr. 4, 1841
	John Tyler, Virginia		Apr. 6, 1841, to Mar. 4, 1845
15	James K. Polk, Tennessee	George M. Dallas, Pennsylvania	Mar. 4, 1845, to " 1849
16	Zachary Taylor, Louisiana	Millard Fillmore, New York	" 1849, to July 9, 1850
	Millard Fillmore, New York		July 9, 1850, to Mar. 4, 1853
17	Franklin Pierce, New Hampshire	William R. King, Alabama	Mar. 4, 1853, to " 1857
18	James Buchanan, Pennsylvania	John C. Breckinridge, Kentucky	" 1857, to " 1861
19	Abraham Lincoln, Illinois	Hannibal Hamlin, Maine	" 1861, to " 1865
20	Abraham Lincoln, Illinois	Andrew Johnson, Tennessee	" 1865, to Apr. 14, 1865
	Andrew Johnson, Tennessee		Apr. 15, 1865, to Mar. 4, 1869
21	Ulysses S. Grant, Illinois	Schuyler Colfax, Indiana	Mar. 4, 1869, to " 1873
22	Ulysses S. Grant, Illinois	Henry Wilson, Massachusetts	" 1873, to " 1877
23	Rutherford B. Hayes, Ohio	William A. Wheeler, New York	" 5, 1877, to " 1881
24	James A. Garfield, Ohio	Chester A. Arthur, New York	" 4, 1881, to Sept. 19, 1881
	Chester A. Arthur, New York		Sept. 20, 1881, to Mar. 4, 1885
25	Grover Cleveland, New York	Thomas A. Hendricks, Indiana. D. Nov. 25, 1885.	Mar. 4, 1885, to " 1889
26	Benjamin Harrison, Indiana	Levi P. Morton, New York	" 1889, to " 1893
27	Grover Cleveland, New York	Adlai E. Stevenson, Illinois	" 1893, to " 1897
28	William McKinley, Ohio	Garret A. Hobart, New Jersey. D. Nov. 2, 1899.	" 1897, to " 1901
29	William McKinley, Ohio	Theodore Roosevelt, New York	" 1901.

the laws of the several States, but an act of Congress provides that the presidential electors shall be all chosen upon the same day—viz., on Tuesday after the first Monday in November. (See ELECTORS.) A majority of the aggregate number of votes given is necessary to the election of President and Vice-President; and if none of the candidates has such a majority, then the election of President is determined by the House of Representatives from among the three candidates having the highest number of electoral votes, and that of the Vice-President by the Senate from among the two candidates having the highest number. In voting for President the vote is taken by States, the entire delegation from any State having but one vote. No person can be President or Vice-President who is not a native-born citizen. The President is commander-in-chief of the army and navy, and of the militia when in the service of the Union. With the concurrence of two-thirds of the Senate he has the power to make treaties, and to appoint civil and military officers. He has a veto on all laws passed by Congress, but so qualified that, notwithstanding his disapproval, any bill becomes a law on its being afterward approved of by two-thirds of both Houses of Congress. The President has a salary of $50,000 a year, and the Executive Mansion at Washington for a residence during his official term. The Vice-President is *ex-officio* president of the Senate; and in case of the death, resignation, or other disability of the President the powers and duties of that office devolve upon him for the remainder of the term for which the President had been elected. This provision of the Constitution came into operation for the first time in 1841, on the demise of William H. Harrison, who died one month after his inauguration, when John Tyler, the Vice-President, succeeded to the presidency. Vice-President Fillmore succeeded President Taylor. Vice-President Johnson succeeded President Lincoln in 1865, and Vice-President Arthur succeeded President Garfield in 1881. In case of the removal, death, resignation, or inability of both the President and the Vice-President, the Secretary of State is the first officer in the line of succession. See CONSTITUTION OF THE UNITED STATES, CONGRESS, LAW-MAKING, METHODS OF; and LEGISLATURES.

The administrative business of the nation is conducted by several high officers, of whom six have the title of secretary, and who form what is termed the cabinet, or advisory council, of the President. These are the Secretary of State, the Secretary of the Interior, the Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Postmaster-General, the Attorney-General (the official law authority for advisement in administrative affairs), and the Secretary of Agriculture. They are appointed by the President, by and with the advice and consent of the Senate, and the several departments of the Government are under their direct control. (See the articles on the respective departments.) The following table gives the names and dates of appointment of those who have held the several offices since the adoption of the Constitution, although the Postmaster-General was not a member of the cabinet till 1829:

SECRETARIES OF STATE.

Thomas Jefferson, Va	Sept. 26, 1789	Hugh S. Legaré, S. C	May 9, 1843	James G. Blaine, Me	Mar. 5, 1881
Edm. Randolph, Va	Jan. 2, 1794	Abel P. Upshur, Va	July 24, 1843	Fred. T. Frelinghuysen, N. J	Dec. 12, 1881
Timothy Pickering, Mass	Dec. 10, 1795	John C. Calhoun, S. C	Mar. 6, 1844	Thomas F. Bayard, Del	Mar. 5, 1885
John Marshall, Va	May 13, 1800	James Buchanan, Pa	Mar. 6, 1845	James G. Blaine, Me	Mar. 5, 1889
James Madison, Va	Mar. 5, 1801	John M. Clayton, Del	Mar. 7, 1849	John W. Foster, Ind	June 29, 1892
Robert Smith, Md	Mar. 6, 1809	Daniel Webster, Mass	July 22, 1850	Walter Q. Gresham, Ill	Mar. 6, 1893
James Mouroe, Va	Apr. 2, 1811	Edw. Everett, Mass	Nov. 6, 1852	Richard Olney, Mass	Juue 1, 1895
John Q. Adams, Mass	Mar. 5, 1817	William L. Marcy, N. Y	Mar. 7, 1853	John Sherman, O	Mar. 5, 1897
Henry Clay, Ky	Mar. 7, 1825	Lewis Cass, Mich	Mar. 6, 1857	William R. Day	Apr. 26, 1898
Martin Van Buren, N. Y	Mar. 6, 1829	Jere. S. Black, Pa	Dec. 17, 1860	John Hay	Sept. 30, 1898
Ed. Livingston, La	May 24, 1831	William H. Seward, N. Y	Mar. 5, 1861		
Louis McLane, Del	May 29, 1833	Elihu B. Washburne, Ill	Mar. 5, 1869		
John Forsyth, Ga	June 27, 1834	Hamilton Fish, N. Y	Mar. 11, 1869		
Daniel Webster, Mass	Mar. 5, 1841	William M. Evarts, N. Y	Mar. 12, 1877		

SECRETARIES OF THE TREASURY.

Alexander Hamilton, N. Y	Sept. 11, 1789	George M. Bibb, Ky	June 15, 1844	William Windom, Minn	Mar. 5, 1881
Oliver Wolcott, Conn	Feb. 2, 1795	Robert J. Walker, Miss	Mar. 6, 1845	Charles J. Folger, N. Y	Oct. 27, 1881
Samuel Dexter, Mass	Jan. 1, 1801	William M. Meredith, Pa	Mar. 8, 1849	Walter Q. Gresham, Ind	Sept. 24, 1884
Albert Gallatin, Pa	May 14, 1801	Thomas Corwin, O	July 23, 1850	Hugh McCulloch, Ind	Oct. 28, 1884
George W. Campbell, Tenn	Feb. 9, 1814	James Guthrie, Ky	Mar. 7, 1853	Daniel Manuing, N. Y	Mar. 5, 1885
Alex. J. Dallas, Pa	Oct. 6, 1814	Howell Cobb, Ga	Mar. 6, 1857	Charles S. Fairchild, N. Y	Apr. 1, 1887
William H. Crawford, Ga	Oct. 22, 1816	Philip F. Thomas, Md	Dec. 12, 1860	William Windom, Minn	Mar. 5, 1889
Richard Rush, Pa	Mar. 7, 1825	John A. Dix, N. Y	Jan. 11, 1861	Charles Foster, O	Feb. 24, 1891
Samuel D. Ingham, Pa	Mar. 6, 1829	Salmon P. Chase, O	Mar. 7, 1861	John G. Carlisle, Ky	Mar. 6, 1893
Louis McLane, Del	Aug. 2, 1831	William P. Fessenden, Me	July 1, 1864	Lyman J. Gage, Ill	Mar. 5, 1897
William J. Duane, Pa	May 29, 1833	Hugh McCulloch, Ind	Mar. 7, 1865		
Roger B. Taney, Md	Sept. 23, 1833	George S. Boutwell, Mass	Mar. 11, 1869		
Levi Woodbury, N. H	June 27, 1834	William A. Richardson, Mass	Mar. 17, 1873		
Thomas Ewing, O	Mar. 5, 1841	Benjamin H. Bristow, Ky	June 4, 1874		
Walter Forward, Pa	Sept. 13, 1841	Lot M. Morrill, Me	July 7, 1876		
John C. Spencer, N. Y	Mar. 3, 1843	John Sherman, O	Mar. 8, 1877		

SECRETARIES OF WAR.

Henry Knox, Mass	Sept. 12, 1789	Joel R. Poinsett, S. C	Mar. 7, 1837	John A. Rawlins, Ill	Mar. 11, 1869
Timothy Pickering, Mass	Jan. 2, 1795	John Bell, Tenn	Mar. 5, 1841	William W. Belknap, Ia	Oct. 25, 1869
James McHenry, Md	Jan. 27, 1796	John C. Spencer, N. Y	Oct. 12, 1841	Alphonso Taft, O	Mar. 8, 1876
Samuel Dexter, Mass	May 13, 1800	James W. Porter, Pa	Mar. 8, 1843	James D. Cameron, Pa	May 22, 1876
Roger Griswold, Conn	Feb. 3, 1801	William Wilkins, Pa	Feb. 15, 1844	George W. McCrary, Ia	Mar. 12, 1877
Henry Dearborn, Mass	Mar. 5, 1801	William L. Marcy, N. Y	Mar. 6, 1845	Alexander Ramsey, Minn	Dec. 10, 1879
William Eustis, Mass	Mar. 7, 1809	George W. Crawford, Ga	Mar. 8, 1849	Robert T. Lincoln, Ill	Mar. 5, 1881
John Armstrong, N. Y	Jan. 13, 1813	Charles M. Conrad, La	Aug. 15, 1850	William C. Endicott, Mass	Mar. 5, 1885
James Mouroe, Va	Sept. 27, 1814	Jefferson Davis, Miss	Mar. 5, 1853	Redfield Proctor, Vt	Mar. 5, 1889
William H. Crawford, Ga	Aug. 1, 1815	John B. Floyd, Va	Mar. 6, 1857	Stephen B. Elkins, W. Va	Dec. 22, 1891
George Graham, Va	Apr. 7, 1817	Joseph Holt, Ky	Jan. 18, 1861	Daniel S. Lamont, N. Y	Mar. 6, 1893
John C. Calhoun, S. C	Oct. 8, 1817	Simon Cameron, Pa	Mar. 5, 1861	Russell A. Alger, Mich	Mar. 5, 1897
James Barbour, Va	Mar. 7, 1825	Edwin M. Stanton, Pa	Jan. 15, 1862	Elihu Root	Aug. 1, 1899
Peter B. Porter, N. Y	May 26, 1828	Ulysses S. Grant, Ill. (*ad int.*)	Aug. 12, 1867		
John H. Eaton, Tenu	Mar. 9, 1829	Lorenzo Thomas, Del. (*ad int.*)	Feb. 21, 1868		
Lewis Cass, Mich	Aug. 1, 1831	John M. Schofield, Ill	May 28, 1868		

SECRETARIES OF THE NAVY.

Benjamin Stoddert, Md	May 21, 1798	Abel P. Upsher, Va	Sept. 13, 1841	George M. Robeson, N. J	June 25, 1869
Robert Smith, Md	July 15, 1801	David Henshaw, Mass	July 24, 1843	Richard W. Thompson, Ind	Mar. 12, 1877
Jacob Crowninshield, Mass	Mar. 3, 1805	Thomas W. Gilmer, Va	Feb. 15, 1844	Nathan Goff, Jr., W. Va	Jan. 6, 1881
Paul Hamilton, S. C	Mar. 7, 1809	John Y. Mason, Va	Mar. 14, 1844	William H. Hunt, La	Mar. 5, 1881
William Jones, Pa	Jan. 12, 1813	George Bancroft, Mass	Mar. 10, 1845	William E. Chandler, N. H	Apr. 12, 1882
Benj. W. Crowninshield, Mass	Dec. 19, 1814	John Y. Mason, Va	Sept. 9, 1846	William C. Whitney, N. Y	Mar. 5, 1885
Smith Thomson, N. Y	Nov. 9, 1818	William B. Preston, Va	Mar. 8, 1849	Benjamin F. Tracy, N. Y	Mar. 5, 1889
Samuel L. Southard, N. J	Sept. 16, 1823	William A. Graham, N. C	July 22, 1850	Hilary A. Herbert, Ala	Mar. 6, 1893
John Branch, N. C	Mar. 9, 1829	John P. Kennedy, Md	July 22, 1852	John D. Long, Mass	Mar. 5, 1897
Levi Woodbury, N. H	May 23, 1831	James C. Dobbin, N. C	Mar. 7, 1853		
Mahlon Dickerson, N. J	June 30, 1834	Isaac Toucey, Conn	Mar. 6, 1857		
James K. Paulding, N. Y	June 25, 1838	Gideon Welles, Conn	Mar. 5, 1861		
George E. Badger, N. C	Mar. 5, 1841	Adolph E. Boric, Pa	Mar. 5, 1869		

SECRETARIES OF THE INTERIOR.

Thomas Ewing, O	Mar. 8, 1849
Alexander H. H. Stuart, Va	Sept. 12, 1850
Robert McClelland, Mich	Mar. 7, 1853
Jacob Thompson, Miss	Mar. 6, 1857
Caleb B. Smith, Ind	Mar. 5, 1861
John P. Usher, Ind	Jan. 8, 1863
James Harlan, Ia	May 15, 1865
Orville H. Browning, Ill	July 27, 1866
Jacob D. Cox, O	Mar. 5, 1869
Columbus Delano, O	Nov. 1, 1870
Zach. Chandler, Mich	Oct. 19, 1875
Carl Schurz, Mo	Mar. 12, 1877
Samuel J. Kirkwood, Ia	Mar. 5, 1881
Henry M. Teller, Col	Apr. 6, 1882
Lucius Q. C. Lamar, Miss	Mar. 5, 1885
William F. Vilas, Wis	Jan. 16, 1888
John W. Noble, Mo	Mar. 5, 1889
Hoke Smith, Ga	Mar. 6, 1893
David R. Francis, Mo	Aug. 22, 1896
Cornelius N. Bliss, N. Y	Mar. 5, 1897
Ethan A. Hitchcock	Dec. 21, 1898

POSTMASTERS-GENERAL.

Samuel Osgood, Mass	Sept. 26, 1789
Timothy Pickering, Mass	Aug. 12, 1791
Joseph Habersham, Ga	Feb. 25, 1795
Gideon Granger, Conn	Nov. 28, 1801
Return J. Meigs, O	Mar. 17, 1814
John McLean, O	June 26, 1823
William T. Barry, Ky	Mar. 9, 1829
Amos Kendall, Ky	May 1, 1835
John M. Niles, Conn	May 25, 1840
Francis Granger, N. Y	Mar. 6, 1841
Charles A. Wickliffe, Ky	Sept. 13, 1841
Cave Johnson, Tenn	Mar. 6, 1845
Jacob Collamer, Vt	Mar. 8, 1849
Nathan K. Hall, N. Y	July 23, 1850
Samuel D. Hubbard, Conn	Aug. 21, 1852
James Campbell, Pa	Mar. 5, 1853
Aaron V. Brown, Tenn	Mar. 6, 1857
Joseph Holt, Ky	Mar. 14, 1859
Horatio King, Me	Feb. 12, 1861
Montgomery Blair, Md	Mar. 5, 1861
William Dennison, O	Sept. 24, 1864
Alexander W. Randall, Wis	July 25, 1866
John A. J. Creswell, Md	Mar. 5, 1869
Marshall Jewell, Conn	Aug. 24, 1874
James N. Tyner, Ind	July 12, 1876
David M. Key, Tenn	Mar. 12, 1877
Horace Maynard, Tenn	June 2, 1880
Thomas L. James, N. Y	Mar. 5, 1881
Timothy O. Howe, Wis	Dec. 20, 1881
Walter Q. Gresham, Ind	Apr. 3, 1883
Frank Hatton, Ia	Oct. 14, 1884
William F. Vilas, Wis	Mar. 5, 1885
Don M. Dickinson, Mich	Jan. 16, 1888
John Wanamaker, Pa	Mar. 5, 1889
Wilson S. Bissell, N. Y	Mar. 6, 1893
William L. Wilson, W. Va	Apr. 1, 1895
James A. Gary, Md	Mar. 5, 1897
Charles Emory Smith	Apr. 21, 1898

ATTORNEYS-GENERAL.

Edmund Randolph, Va	Sept. 26, 1789
William Bradford, Pa	Jan. 27, 1794
Charles Lee, Va	Dec. 10, 1795
Theophilus Parsons, Mass	Feb. 20, 1801
Levi Lincoln, Mass	Mar. 5, 1801
Robert Smith, Md	Mar. 3, 1805
J. Breckinridge, Ky	Aug. 7, 1805
Cæsar A. Rodney, Del	Jan. 28, 1807
William Pinkney, Md	Dec. 11, 1811
Richard Rush, Pa	Feb. 10, 1814
William Wirt, Md	Nov. 13, 1817
John McP. Berrien, Ga	Mar. 9, 1829
Roger B. Taney, Md	July 20, 1831
Benjamin F. Butler, N. Y	Nov. 15, 1833
Felix Grundy, Tenn	July 5, 1838
Henry J. Gilpin, Pa	Jan. 11, 1840
John J. Crittenden, Ky	Mar. 5, 1841
Hugh S. Legaré, S. C	Sept. 13, 1841
John Nelson, Md	July 1, 1843
John Y. Mason, Va	Mar. 6, 1845
Nathan Clifford, Me	Oct. 17, 1846
Isaac Toucey, Conn	June 21, 1848
Reverdy Johnson, Md	Mar. 8, 1849
John J. Crittenden, Ky	July 22, 1850
Caleb Cushing, Mass	Mar. 7, 1853
Jeremiah S. Black, Pa	Mar. 6, 1857
Edwin M. Stanton, Pa	Dec. 20, 1860
Edward Bates, Mo	Mar. 5, 1861
Titian J. Coffey, Pa. (*ad int.*)	June 22, 1863
James Speed, Ky	Dec. 2, 1864
Henry Stanberry, O	July 23, 1866
William M. Evarts, N. Y	July 15, 1868
Ebenezer R. Hoar, Mass	Mar. 5, 1869
Amos T. Akerman, Ga	June 23, 1870
George H. Williams, Ore	Dec. 14, 1871
Edwards Pierrepont, N. Y	Apr. 26, 1875
Alphonso Taft, O	May 22, 1876
Charles Devens, Mass	Mar. 12, 1877
Wayne MacVeagh, Pa	Mar. 5, 1881
Benjamin H. Brewster, Pa	Dec. 19, 1881
Augustus H. Garland, Ark	Mar. 5, 1885
William H. H. Miller, Ind	Mar. 5, 1889
Richard Olney, Mass	Mar. 6, 1893
Judson Harmon, O	June 7, 1895
Joseph McKenna, Cal	Mar. 5, 1897
John W. Griggs	Jan. 22, 1898

SECRETARIES OF AGRICULTURE.

Norman J. Coleman	Feb. 12, 1889
J. M. Rusk, Wis	Mar. 5, 1889
J. Sterling Morton, Neb	Mar. 6, 1893
James Wilson, Ia	Mar. 5, 1897

SUMMARY OF POPULAR AND ELECTORAL VOTES FOR PRESIDENT AND VICE-PRESIDENT OF THE U. S.

Year of election.	Number of states voting.	Total electoral vote.	Political party.	PRESIDENTS.* Candidates.	Vote. States.	Vote. Popular.	Vote. Electoral.	VICE-PRESIDENTS.* Candidates.	Electoral vote.
1789	† 10	73		George Washington	..		69		..
				John Adams	..		...		34
				John Jay	..		...		9
				Richard H. Harrison	..		...		6
				John Rutledge	..		...		6
				John Hancock	..		...		4
				George Clinton	..		...		3
				Samuel Huntingdon	..		...		2
				John Milton	..		...		2
				James Armstrong	..		...		1
				Benjamin Lincoln	..		...		1
				Edward Telfair	..		...		1
				Vacancies	..		4		4
1792	15	135	Federalist	George Washington	..		132		..
			Federalist	John Adams	..		...		77
			Republican	George Clinton	..		...		50
				Thomas Jefferson	..		...		4
				Aaron Burr	..		...		1
				Vacancies	..		3		3
1796	16	138	Federalist	John Adams	..		71		..
			Republican	Thomas Jefferson	..		...		68
			Federalist	Thomas Pinckney	..		...		59
			Republican	Aaron Burr	..		...		30
				Samuel Adams	..		...		15
				Oliver Ellsworth	..		...		11
				George Clinton	..		...		7
				John Jay	..		...		5
				James Iredell	..		...		3
				George Washington	..		...		2
				John Henry	..		...		2
				Samuel Johnson	..		...		2
				Charles C. Pinckney	..		...		1
1800	16	138	Republican	Thomas Jefferson	..		‡ 73		..
			Republican	Aaron Burr	..		...		‡ 73
			Federalist	John Adams	..		...		65
			Federalist	Charles C. Pinckney	..		...		64
				John Jay	..		...		1

* Previous to the election of 1804 each elector voted for two candidates for President; the one receiving the highest number of votes, if a majority, was declared elected President, and the next highest Vice-President.

† Three States out of thirteen did not vote—viz., New York, which had not passed an electoral law, and North Carolina and Rhode Island, which had not adopted the Constitution.

‡ There having been a tie vote, the choice devolved upon the House of Representatives. A choice was made on the thirty-sixth ballot, which was as follows: Jefferson—Georgia, Kentucky, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Vermont, and Virginia—10 States; Burr—Connecticut, Massachusetts, New Hampshire, and Rhode Island—4 States; Blank—Delaware and South Carolina—2 States.

SUMMARY OF POPULAR AND ELECTORAL VOTES FOR PRESIDENT AND VICE-PRESIDENT OF THE U. S.—(CONTINUED.)

Year of election.	Number of States.	Total electoral vote.	Political party.	PRESIDENTS. Candidates.	Vote. States.	Vote. Popular.	Vote. Electoral.	VICE-PRESIDENTS. Candidates.	Electoral vote.
1804	17	176	Republican	Thomas Jefferson	15	.....	162	George Clinton	162
			Federalist	Charles C. Pinckney	2	.....	14	Rufus King	14
1808	17	176	Republican	James Madison	12	.....	122	George Clinton	113
			Federalist	Charles C. Pinckney	5	.....	47	Rufus King	47
				George Clinton	..	.....	6	John Langdon	9
								James Madison	3
								James Monroe	3
				Vacancy	..	.....	1	.....	1
1812	18	218	Republican	James Madisou	11	.....	128	Elbridge Gerry	131
			Federalist	De Witt Clinton	7	.....	89	Jared Ingersoll	86
				Vacancy	..	.....	1	.....	1
1816	19	221	Republican	James Monroe	16	.....	183	Daniel D. Tompkins	183
			Federalist	Rufus King	3	.....	34	John E. Howard	22
								James Ross	5
								Johu Marshall	4
								Robert G. Harper	3
				Vacancies	..	.....	4	.....	4
1820	24	235	Republican	James Monroe	24	.....	231	Daniel D. Tompkins	218
			Opposition	John Q. Adams	..	.....	1	Richard Stocktou	8
								Daniel Rodney	4
								Robert G. Harper	1
								Richard Rush	1
				Vacancies	..	.....	3	.....	3
1824	24	261	Republican	Andrew Jacksou	10	155,872	*99	John C. Calhoun	182
			Coalition	John Q. Adams	8	105,321	84	Nathan Sanford	30
			Republican	Wm. H. Crawford	3	44,282	41	Nathaniel Macon	24
			Republican	Henry Clay	3	46,587	37	Andrew Jackson	13
								Martin Van Buren	9
								Henry Clay	2
				Vacancy	..	.....	...	.....	1
1828	24	261	Democratic	Andrew Jackson	15	647,231	178	John C. Calhoun	171
			National Republicau	John Q. Adams	9	509,097	83	Richard Rush	83
								William Smith	7
1832	24	288	Democratic	Andrew Jackson	15	687,502	219	Martin Van Buren	189
			National Republican	Henry Clay	7	530,189	49	John Sergeant	49
			Anti-Mason	John Floyd	1	33,108	11	Henry Lee	11
				William Wirt	1		7	Amos Ellmaker	7
								William Wilkins	30
				Vacancies	..	.....	2	.....	2
1836	26	294	Democratic	Martin Van Buren	15	761,549	170	Richard M. Johnson†	147
			Whig	Wm. H. Harrison	7	736,656	73	Francis Granger	77
			Whig	Hugh L. White	2		26	John Tyler	47
			Whig	Daniel Webster	1		14	William Smith	23
			Whig	Willie P. Mangum	1		11		
1840	26	294	Whig	Wm. H. Harrison	19	1,275,017	234	John Tyler	234
			Democratic	Martin Van Buren	7	1,128,702	60	Richard M. Johnson	48
			Liberty	James G. Birney	..	7,059			
								Littleton W. Tazewell	11
								James K. Polk	1
1844	26	275	Democratic	James K. Polk	15	1,337,243	170	Geo. M. Dallas	170
			Whig	Henry Clay	11	1,299,068	105	Theodore Frelinghuysen	105
			Liberty	James G. Birney	..	62,300			
1848	30	290	Whig	Zachary Taylor	15	1,360,101	163	Millard Fillmore	163
			Democratic	Lewis Cass	15	1,220,544	127	William O. Butler	127
			Free Soil	Martin Van Buren	..	291,263	...	Chas. F. Adams	
1852	31	296	Democratic	Franklin Pierce	27	1,601,474	254	William R. King	254
			Whig	Winfield Scott	4	1,386,578	42	William A. Graham	42
			Free Soil	John P. Hale	..	156,149	...	George W. Julian	
1856	31	296	Democratic	James Buchanan	19	1,838,169	174	John C. Breckinridge	174
			Republican	John C. Frémont	11	1,341,264	114	William L. Dayton	114
			American	Millard Fillmore	1	874,534	8	Andrew J. Donelson	8
1860	33	303	Republican	Abraham Lincoln	17	1,866,352	180	Hannibal Hamlin	180
			Democratic	John C. Breckenridge	11	845,763	72	Joseph Lane	72
			Cons. Union	John Bell	3	589,581	39	Edward Everett	39
			Ind. Dem	Stephen A. Douglas	2	1,375,157	12	Herschel V. Johnson	12
1864	‡25	314	Republican	Abraham Lincoln	22	2,216,067	212	Andrew Johnson	212
			Democratic	George B. McClellan	3	1,808,725	21	George H. Pendleton	21
				Vacancies	11	.....	81	.....	81
1868	§34	317	Republican	Ulysses S. Grant	26	3,015,071	214	Schuyler Colfax	214
			Democratic	Horatio Seymour	8	2,709,613	80	Frank P. Blair, Jr	80
				Vacancies	3	.....	23	.....	23
1872	37	366	Republican	Ulysses S. Grant	29	3,597,070	286	Henry Wilson	286
			Dem. and Liberal	Horace Greeley	6	2,834,079	...	B. Gratz Brown	47
			Democratic	Charles O'Conor	..	29,408	...	George W. Julian	5
			Temperance	James Black	..	5,608	...	Alfred H. Colquitt	5
				Thomas A. Hendricks	..	.....	42	John M. Palmer	3
				B. Gratz Brown	..	.....	18	Thomas E. Bramlette	3
				Charles J. Jenkins	..	.....	2	William S. Groesbeck	1
				David Davis	..	.....	1	Willis B. Machen	1
								Nathaniel P. Banks	1
1876	38	369	Republican	Rutherford B. Hayes	21	4,033,950	185	William A. Wheeler	185
			Democratic	Samuel J. Tilden	17	4,284,885	184	Thomas A. Hendricks	184
			Greenback	Peter Cooper	..	81,740			
			Prohibition	Green Clay Smith	..	9,522			
				Scattering	..	2,636			
1880	38	369	Republican	James A. Garfield	19	4,449,053	214	Chester A. Arthur	214
			Democratic	Winfield S. Hancock	19	4,442,035	155	William H. English	155
			Greenback	James B. Weaver	..	307,306	...	Benjamin J. Chambers.	
				Scattering	..	12,576			

* No choice having been made by the electoral college, the election of a President devolved upon the House of Representatives, in accordance with a provisiou of the twelfth amendment to the Constitution. This directs that only the three candidates who stand highest in the electoral vote shall be voted for. A choice was made on the first ballot, which was as follows: Adams—Connecticut, Illinois, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Missouri, New Hampshire, New York, Ohio, Rhode Island, and Vermont—13 States; Jackson—Alabama, Indiana, Mississippi, New Jersey, Pennsylvania, South Carolina, and Tennessee—7 States; Crawford—Delaware, Georgia, North Carolina, and Virginia—4 States.

† No candidate having received a majority of the votes of the electoral college, the Senate elected R. M. Johnson Vice-President, who received 33 votes; Francis Granger received 16.

‡ Eleven States did not vote—viz., Alabama, Arkausas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

§ Three States did not vote—viz., Mississippi, Texas, and Virginia.

SUMMARY OF POPULAR AND ELECTORAL VOTES FOR PRESIDENT AND VICE-PRESIDENT OF THE U. S.—(CONTINUED).

Year of election.	Number of States.	Total electoral vote.	Political party.	PRESIDENTS. Candidates.	Vote. States.	Vote. Popular.	Vote. Electoral.	VICE-PRESIDENTS. Candidates.	Electoral vote.
1884	38	401	Democratic	Grover Cleveland	20	4,911,017	219	Thomas A. Hendricks	219
			Republican	James G. Blaine	18	4,848,334	182	John A. Logan	182
			Prohibition	John P. St. John	..	151,809	...	William Daniel.	
			Greenback	Benjamin F. Butler	..	133,825	...	Absalom M. West.	
				Scattering	..	11,362			
1888	38	401	Republican	Benjamin Harrison	20	5,440,551	233	Levi P. Morton	233
			Democratic	Grover Cleveland	18	5,538,434	168	Allen G. Thurman	168
			Prohibition	Clinton P. Fisk	..	250,290	...	John A. Brooks.	
			Union Labor	Alson J. Streeter	..	147,045	...	Charles E. Cunningham.	
				Scattering	..	10,312			
1892	44	444	Democratic	Grover Cleveland	23	5,556,918	277	Adlai E. Stevenson	277
			Republican	Benjamin Harrison	16	5,176,108	145	Whitelaw Reid	145
			People's Party	James B. Weaver	5	1,041,028	22	James G. Field	22
			Prohibition	John Bidwell	..	264,133	...	James B. Cranfield.	
			Social Labor	Simon Wing	..	21,164	...	Charles H. Matchett.	
1896	45	447	Republican	William McKinley	23	7,106,199	271	Garret A. Hobart	271
			Democratic	William J. Bryan	22	6,502,685	176	Arthur Sewall	176
			Populist	William J. Bryan				Thomas E. Watson.	
			Prohibition	Joshua Levering	..	131,757	...	Hale Johnson.	
			National Democratic	John M. Palmer	..	132,871	...	Simon B. Buckner.	
			Social Labor	Charles H. Matchett	..	36,258	...	Matthew Maguire.	

ELECTORAL VOTE FOR PRESIDENT, 1864–1900.

STATES.	1864. Lincoln, Republican.	1864. McClellan, Democrat.	1868. Grant, Republican.	1868. Seymour, Democrat.	1872. Grant, Republican.	1872. * Hendricks, Democrat.	1876. Hayes, Republican.	1876. Tilden, Democrat.	1880. Garfield, Republican.	1880. Hancock, Democrat.	1884. Cleveland, Democrat.	1884. Blaine, Republican.	1888. Harrison, Republican.	1888. Cleveland, Democrat.	1892. Cleveland, Democrat.	1892. Harrison, Republican.	1892. Weaver, Populist.	1896. McKinley, Republican.	1896. Bryan, Democrat.	1900. McKinley, Republican.	1900. Bryan, Democrat
Alabama	..	..	8	..	10	..	..	10	..	10	10	..	..	10	11	..	..	..	11	..	11
Arkansas	..	..	5	..	..	..	..	6	..	6	7	..	..	7	8	..	..	..	8	..	8
California	5	..	5	..	6	..	6	..	1	5	..	8	8	..	8	1	..	8	1	9	..
Colorado	..	..	..	..	..	..	3	..	3	..	..	3	3	..	..	..	4	..	4	..	4
Connecticut	6	..	6	..	6	..	..	6	6	..	6	..	..	6	6	..	..	6	..	6	..
Delaware	..	3	..	3	3	..	..	3	..	3	3	..	..	3	3	..	..	3	..	3	..
Florida	..	..	3	..	4	..	4	..	..	4	4	..	..	4	4	..	..	..	4	..	4
Georgia	..	..	..	9	..	..	..	11	..	11	12	..	..	12	13	..	..	..	13	..	13
Idaho	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	3	..	3
Illinois	16	..	16	..	21	..	21	..	21	..	..	22	22	..	24	..	..	24	..	24	..
Indiana	13	..	13	..	15	..	..	15	15	..	15	..	15	..	15	..	..	15	..	15	..
Iowa	8	..	8	..	11	..	11	..	11	..	..	13	13	..	..	13	..	13	..	13	..
Kansas	3	..	3	..	5	..	5	..	5	..	..	9	9	..	..	..	10	..	10	10	..
Kentucky	..	11	..	11	..	8	..	12	..	12	13	..	..	13	13	..	..	12	1	..	13
Louisiana	..	..	..	7	..	..	8	..	..	8	8	..	..	8	8	..	..	..	8	..	8
Maine	7	..	7	..	7	..	7	..	7	..	..	6	6	..	..	6	..	6	..	6	..
Maryland	7	..	..	7	..	8	..	8	..	8	8	..	..	8	8	..	..	8	..	8	..
Massachusetts	12	..	12	..	13	..	13	..	13	..	..	14	14	..	..	15	..	15	..	15	..
Michigan	8	..	8	..	11	..	11	..	11	..	..	13	13	..	5	9	..	14	..	14	..
Minnesota	4	..	4	..	5	..	5	..	5	..	..	7	7	..	..	9	..	9	..	9	..
Mississippi	..	..	..	..	8	..	..	8	..	8	9	..	..	9	9	..	..	..	9	..	9
Missouri	11	..	11	..	..	6	..	15	..	15	16	..	..	16	17	..	..	..	17	..	17
Montana	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	3	..	3
Nebraska	..	..	3	..	3	..	3	..	3	..	..	5	5	..	..	8	..	..	8	8	..
Nevada	2	..	3	..	3	..	3	..	..	3	..	3	3	..	..	..	3	..	3	..	3
New Hampshire	5	..	5	..	5	..	5	..	5	..	..	4	4	..	..	4	..	4	..	4	..
New Jersey	..	7	..	7	9	..	..	9	..	9	9	..	..	9	10	..	..	10	..	10	..
New York	33	..	..	33	35	..	..	35	35	..	36	..	36	..	36	..	..	36	..	36	..
North Carolina	..	..	9	..	10	..	..	10	..	10	11	..	..	11	11	..	..	..	11	..	11
North Dakota	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	3	..	3	..
Ohio	21	..	21	..	22	..	22	..	22	..	..	23	23	..	1	22	..	23	..	23	..
Oregon	3	..	..	3	3	..	3	..	3	..	..	3	3	..	..	3	1	4	..	4	..
Pennsylvania	26	..	26	..	29	..	29	..	29	..	..	30	30	..	..	32	..	32	..	32	..
Rhode Island	4	..	4	..	4	..	4	..	4	..	..	4	4	..	..	4	..	4	..	4	..
South Carolina	..	..	6	..	7	..	7	..	..	7	9	..	..	9	9	..	..	..	9	..	9
South Dakota	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	4	4	..
Tennessee	..	..	10	..	..	12	..	12	..	12	12	..	..	12	12	..	..	..	12	..	12
Texas	..	..	..	..	..	8	..	8	..	8	13	..	..	13	15	..	..	..	15	..	15
Utah	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	..
Vermont	5	..	5	..	5	..	5	..	5	..	..	4	4	..	..	4	..	4	..	4	..
Virginia	..	..	..	..	11	..	..	11	..	11	12	..	..	12	12	..	..	..	12	..	12
Washington	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	4	4	..
West Virginia	5	..	5	..	5	..	..	5	..	5	6	..	..	6	6	..	..	6	..	6	..
Wisconsin	8	..	8	..	10	..	10	..	10	..	..	11	11	..	12	..	..	12	..	12	..
Wyoming	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	3	3	..
Totals	212	21	214	80	286	42	185	184	214	155	219	182	233	168	277	145	22	271	176	292	155
No. States voting.	25		34		37		38		38		38		38		44			45		45	

* In 1872 Horace Greeley, Democratic and Liberal-Republican candidate for President, having died before the electoral vote was cast, the Greeley electors voted as above for Thomas A. Hendricks in five States. Kentucky, Georgia, and Missouri cast 18 electoral votes for B. Gratz Brown, of Missouri, for President, Georgia 2 votes for Charles J. Jenkins, of Georgia, and Missouri 1 vote for David Davis, of Illinois; and 17 votes irregularly cast were not counted by Congress.

Courts.—The judicial powers of the U. S. are vested in a Supreme Court and such other inferior courts as Congress may from time to time establish. The present judicial establishments consist of a Supreme Court, circuit courts, and district courts. The Supreme Court, the highest judicial tribunal of the Union, is composed of a chief justice and eight associate justices. One session is held annually at the capital, beginning on the first Monday in October and closing generally early in May. See COURTS.

CHIEF JUSTICES AND DATES OF APPOINTMENT.

John Jay, N. Y.	Sept. 26, 1789	John Marshall, Va.	Jan. 27, 1801	Morrison R. Waite, O.	Jan. 21, 1874
John Rutledge, S. C.	July 1, 1795	Roger P. Taney, Md.	Dec. 28, 1835	Melville W. Fuller, Ill.	July 20, 1888
Oliver Ellsworth, Conn.	Mar. 4, 1796	Salmon P. Chase, O.	Dec. 6, 1864		

The circuit courts are held by a justice of the Supreme Court and the judge of the district in which the court sits, conjointly. The U. S. is divided into nine judicial circuits, in each of which a session is held twice a year.

CIRCUITS.

I. Me., N. H., Mass., R. I.
II. Vt., Conn., N. Y.
III. Del., N. J., and Pa.
IV. Md., Va., W. Va., N. C., S. C.
V. Ga., Fla., Ala., Miss., La., Tex.
VI. O., Mich., Ky., and Tenn.
VII. Ill., Ind., and Wis.
VIII. Minn., Ia., Mo., Kan., Ark., Neb., Col., N. Dak., S. Dak., Wyo., N. Mex., Okla., and Utah.
IX. Cal., Ore., Nev., Mont., Wash., Ida., Ariz., and Alaska.

The district courts are held by the district judges alone. Each State forms one or more districts. There are, besides these, territorial courts, which are temporary, and lose that character whenever a Territory becomes a State. Each court has a clerk, an attorney, and a marshal. All judges of the U. S. courts are appointed by the President, by and with the advice and consent of the Senate, and hold their offices during good behavior. See COURTS.

Political Subdivisions—The political organization of the States is essentially similar to that of the general Government, the chief executive officer being the Governor. Legislative functions are carried on by a Legislature consisting of two houses, similar to the Federal Congress, and the laws are enforced by a State judiciary. The government of the organized Territories is in part by the general Government and in part by the people. The President appoints the Governor and certain other territorial officers, while the Legislature is elected by the people of the Territory. The District of Columbia is governed directly by the general Government, the President appointing its executive, which consists of three commissioners. Its laws are made by Congress, and its judiciary is appointed by the President. Indian Territory and Alaska are unorganized Territories.

The States are divided into counties, which in the case of Louisiana are known as parishes, and the counties are subdivided in various ways. The relative power reposed in the county government and in that of its subdivisions differs greatly in different States. In New England the counties are divided into towns or cities, and these towns and cities retain nearly all the powers of government not assumed by the States, the county being comparatively unimportant as a political division. In the northern States of the Mississippi valley the counties are, as a rule, divided into townships, and the powers are shared in almost equal proportion by these townships and the counties. In the Southern and most of the Western States, the subdivisions of the county are politically very feeble, nearly all the powers being held by the county government. These subdivisions bear various names, being known in Delaware as hundreds, in Maryland, Florida, and other States as election districts, in the Virginias and Kentucky as magisterial districts, in the Carolinas and Arkansas as townships, in Georgia as militia districts, in Alabama and Mississippi as beats, and in Louisiana as wards.

Various classes of municipalities are chartered in different States. Cities are chartered in all States, and in some all municipal incorporations are designated as cities of a certain class, as in Missouri, where four classes of cities are chartered. The New England city is simply a chartered town. In some States cities are independent of the township organization, in others are subject to it. Some cities are independent of county organization, as Baltimore and St. Louis, and some comprise the entire county, as New York and San Francisco. In most of the States towns and villages are incorporated; in New Jersey and Pennsylvania boroughs are chartered; and in Ohio minor incorporations, known as hamlets, exist.

Altogether, there were, in 1890, nearly 45,000 distinct governments coexistent in the U. S., including the States, Territories, counties, townships, and other county subdivisions, and the various classes of municipal incorporations.

SUMMARY OF THE STATES AND TERRITORIES.

STATES AND TERRITORIES.	SETTLEMENT.		DATE OF ACT CREATING		Term of Governor, years.	TERM OF LEGISLATURE, YEARS.		Capital.
	By whom.	Date.	Territory.	State.		Senate.	House.	
Alabama	French.	1713	Mar. 3, 1817.	Dec. 14, 1819.	2	4	2	Montgomery.
Alaska	Russians.	1805	May 17, 1884.	.....	4	..	..	Sitka.
Arizona	Spanish.	1598	Feb. 24, 1863.	.....	4	2	2	Phœnix.
Arkansas	French.	1670	Mar. 2, 1819.	June 15, 1836.	2	4	2	Little Rock.
California	Spanish.	1769	.....	Sept. 9, 1850.	4	4	2	Sacramento.
Colorado	Americans.	1860	Feb. 28, 1861.	Mar. 3, 1875.	2	4	2	Denver.
Connecticut	English.	1633	Original State.	.....	2	2	2	Hartford.
Delaware	Swedes.	1627	"	.....	4	4	2	Dover.
District of Columbia	Md. and Va.	....	Mar. 3, 1791.	.....	..	..	..	.....
Florida	Spanish.	1564	Mar. 3, 1822.	Mar. 3, 1845.	4	4	2	Tallahassee.
Georgia	English.	1733	Original State.	.....	2	2	2	Atlanta.
Idaho	Americans.	1852	Mar. 3, 1863.	July 3, 1890.	2	2	2	Boise.
Illinois	French.	1749	Feb. 3, 1809.	Dec. 3, 1818.	4	4	2	Springfield.
Indiana	"	1730	May 7, 1800.	Dec. 11, 1816.	4	4	2	Indianapolis.
Iowa	Americans.	1835	July 3, 1838.	Mar. 3, 1845.	2	4	2	Des Moines.
Kansas	"	1850	May 30, 1854.	Jan. 29, 1861.	2	4	2	Topeka.
Kentucky	Virginians.	1775	.....	June 1, 1792.	4	4	2	Frankfort.
Louisiana	French.	1699	Mar. 3, 1805.	Apr. 30, 1812.	4	4	4	Baton Rouge.
Maine	English.	1630	.....	Mar. 15, 1820.	2	2	2	Augusta.
Maryland	"	1634	Original State.	.....	4	4	2	Annapolis.
Massachusetts	"	1620	"	.....	1	1	1	Boston.
Michigan	French.	1670	June 30, 1805.	Jan. 26, 1837.	2	2	2	Lansing.
Minnesota	Americans.	1847	Mar. 3, 1849.	May 11, 1858.	2	4	2	St. Paul.
Mississippi	French.	1716	Apr. 7, 1798.	Dec. 10, 1817.	4	4	4	Jackson.
Missouri	"	1763	Apr. 30, 1812.	Aug. 10, 1821.	4	4	2	Jefferson.
Montana	Americans.	1858	May 26, 1864.	Nov. 8, 1889.	4	4	2	Helena.
Nebraska	"	1850	May 30, 1854.	Mar. 1, 1867.	2	2	2	Lincoln.
Nevada	"	1850	Mar. 2, 1861.	Oct. 31, 1864.	4	4	2	Carson.
New Hampshire	English.	1623	Original State.	.....	2	2	2	Concord.
New Jersey	Swedes.	1627	"	.....	3	3	1	Trenton.
New Mexico	Spanish.	1598	Dec. 13, 1850.	.....	4	2	2	Santa Fé.
New York	Dutch.	1613	Original State.	.....	3	2	1	Albany.
North Carolina	English.	1650	"	.....	4	2	2	Raleigh.
North Dakota	Americans.	1860	Mar. 2, 1861.	Nov. 2, 1889.	2	4	2	Bismarck.
Ohio	Va. and N. Eng.	1788	.....	Nov. 29, 1802.	2	2	2	Columbus.
Oklahoma	Americans.	1890	May 2, 1890.	.....	4	2	2	Guthrie.
Oregon	English.	1796	Aug. 14, 1848.	Feb. 14, 1859.	4	4	2	Salem.
Pennsylvania	"	1682	Original State.	.....	4	4	2	Harrisburg.
Rhode Island	"	1631	"	.....	1	1	1	Providence and Newport.
South Carolina	"	1689	"	.....	2	4	2	Columbia.
South Dakota	Americans.	1860	Mar. 2, 1861.	Nov. 2, 1889.	2	2	2	Pierre.
Tennessee	N. C. and Va.	1765	.....	June 1, 1796.	2	2	2	Nashville.
Texas	Spanish.	1630	.....	Dec. 29, 1845.	2	4	2	Austin.
Utah	Americans.	1847	Sept. 9, 1850.	Jan. 4, 1896.	4	2	2	Salt Lake.
Vermont	English.	1763	.....	Mar. 4, 1791.	2	2	2	Montpelier.
Virginia	"	1607	Original State.	.....	4	4	2	Richmond.
Washington	Americans.	1848	Mar. 2, 1853.	Nov. 11, 1889.	4	4	2	Olympia.
West Virginia	English.	1607	.....	June 19, 1863.	4	4	2	Charleston.
Wisconsin	Americans.	1831	June 3, 1836.	May 29, 1848.	2	4	2	Madison.
Wyoming	"	1864	July 25, 1868.	July 10, 1890.	4	4	2	Cheyenne.

Army and Navy.

The regular army of the U. S. is recruited by voluntary enlistment. The act of Feb. 2, 1901, provided for a maximum enlisted strength of 100,000 men. The present organization is as follows: 30 regiments of infantry, each of 12 companies; 15 regiments of cavalry, each of 12 troops; 126 companies of coast artillery, and 30 batteries of field artillery; 1 battalion of engineers, of 12 companies; the signal corps, the officers and cadets of the Military Academy, unattached enlisted men, Indian scouts, hospital attendants, messengers, etc. Total enlisted strength, 75,787. In 1900 there were 20 general officers, 77 colonels, 98 lieutenant-colonels, 271 majors, 813 captains, 777 first lieutenants, and 532 second lieutenants.

See Army, Military Academies, Machine and Rapid-fire Guns, Magazine-guns, Artillery, Ordnance, and Small-arms.

Militia.—Most of the States maintain an organized militia force. In 1899 this comprised 7,521 commissioned officers and 98,818 enlisted men, exclusive of the naval militia maintained by some of the maritime States. In 1895 this force comprised 226 officers and 2,706 men, with 13 practice-ships, assigned to as many States by the Federal Government.

Navy.—The law of March 3, 1899, provides for an establishment of 18 rear-admirals, 70 captains, 112 commanders, 170 lieutenant-commanders, 300 lieutenants, and 350 lieutenants (junior grade) and ensigns. The old force of 12,500 men and 1,500 apprentices is expanded to 22,500 men and 300 extra officers. Aside from the old iron and wooden cruising vessels, 8 old monitors, and converted yachts and tugs and a few small gunboats, the United States navy in 1901 is as follows: 5 first-class, 4 second-class, and 1 third-class battle-ships; 2 armored and 19 protected cruisers; 20 gunboats; 8 coast-defence ships; 1 armored ram; 10 destroyers; 26 torpedo-boats; and 2 submarine torpedo-boats. In addition the following are building or proposed: 8 first-class battle-ships; 2 coast-defense ships; 15 cruisers; 1 gunboat; 6 torpedo-boats; 10 destroyers; and 6 submarine torpedo-boats. See Ships of War, Navy, and Naval Academies.

Pensions.—There were expended in 1900 by the pension bureau $138,462,130.65, making the total payments since 1861 on account of pensions $2,558,933,938. The number of pensioners on the rolls was 993,529, of which 752,510 were invalid pensioners and 241,019 were widows and children.

Finance.

The total receipts for the year ending June 30, 1900, were $669,595,431, derived from the following sources:

Source.	Amount.
Customs	$233,164,871
Internal revenue	295,327,927
Postal service	102,354,579
Miscellaneous	38,748,054

The total disbursements for the year were $590,068,871, the constituent items of which were:

Legislative	$9,972,217
Executive, proper	207,825
State Department	3,356,174
Treasury Department (except int. on debt)	59,836,146
Interest on public debt	40,160,333
War Department	137,650,329
Navy Department	56,378,312
Interior Department (except pensions)	20,340,778
Pensions	140,877,316
Post-office Department	111,115,755
Department of Agriculture	3,625,851
Department of Labor	173,010
Department of Justice	436,733
Judicial	5,937,592

See Finance, Tariffs, Subsidies, Protection, and Free Trade.

Circulation.—The total amount of money of all kinds in circulation in the country in 1900 was $2,055,150,998, or $26.94 per capita of estimated population, besides which there was in the U. S. treasury $284,549,675, making the total amount of money in circulation and in the treasury $2,339,700,673, or $30.66 per capita. The following table classifies the currency as gold, silver, different kinds of paper, etc.:

Gold:	
In treasury, including bullion	$222,844,953
In circulation	610,806,472
Total	$833,651,425
Certificates in circulation	200,733,019
Total	$1,034,384,444
Silver:	
Silver dollars and bullion in treasury	$15,749,107
Subsidiary coin in treasury	6,702,754
Total	$22,451,861
Dollars in circulation	$65,889,346
Subsidiary coin in circulation	76,160,988
Total	$142,050,334
Certificates in circulation	$408,465,574
Total	$572,967,769
Paper:	
Certificates, act of June 8, 1872, in circulation	$3,705,000
U. S. notes in treasury	29,004,471
In circulation	313,971,545
Total	$346,681,016
National bank-notes in treasury	$9,525,332
In circulation	300,115,112
Total	$313,345,444
Fractional Currency:	
In treasury	$723,058
In circulation	75,303,942
Total	$76,027,000

See the articles Coinage, Mint, Monetary Standards, Silver Coinage, etc.

Public Debt.—The public debt, which, less cash in the treasury, amounted in 1866 to $2,773,000,000, has been greatly reduced, and in 1900 amounted to $1,107,711,257.89, or $14.52 per capita of the population. Of this amount, $1,023,478,860 was interest-bearing, chiefly from 2 to 4 per cent. The debts of States aggregated in 1890 $228,997,389, showing a rapid reduction in the preceding ten years. The debts of counties amounted in the same year to about $145,000,000, and that of municipalities to $724,463,060, these classes showing a slight increase in the ten years preceding. See Debt, Public.

Wealth.—The total assessed valuation of property in 1890 was $25,473,173,418. On this there were levied taxes amounting to $471,365,140. Of the total assessed valuation, $18,956,556,675 was on real estate, and $6,516,616,743 on personal property, being in the proportion of about three to one. The true valuation has been estimated at the time of each census since 1850 as follows:

CENSUS YEAR.	Estimated valuation.	Per capita.
1850	$7,135,780,228	$308
1860	16,159,616,068	514
1870	30,068,518,507	780
1880	43,642,600,000	870
1890	65,037,091,197	1,036

The following are the particular items of the estimate for 1890:

Real estate and improvements	$39,544,544,333
Live stock, farm implements, and machinery	2,703,015,040
Mines, quarries, and products on hand	1,291,291,579
Gold and silver coin and bullion	1,158,774,948
Machinery of mills and products on hand, either raw or manufactured	3,058,593,441
Railways and equipment	8,685,407,323
Telegraphs, telephones, shipping, and canals	701,755,712
Miscellaneous	7,893,708,821
Total	$65,037,091,197

Religion.

In the U. S. the utmost freedom regarding religious belief prevails, and this fact, coupled with the great diversity of the peoples and the independence and boldness of thought, has resulted in the existence of a most bewildering number of religious denominations, the principal of which, with the membership of each, are given in the following table:

Roman Catholic	6,257,871	German Evangel. Synod	187,432
Methodist	4,589,284	Latter-day Saints	166,125
Baptist	3,762,729	Evangelical Association	133,313
Presbyterian	1,278,332	Jews	130,496
Lutheran	1,231,072	Friends	107,208
Christian	744,773	Dunkards	73,795
Protestant Episcopal	540,509	Unitarian	67,749
Congregational	512,771	Adventist	60,491
Reformed	309,458	Universalist	49,194
United Brethren	225,158	Mennonite	41,541

As is seen, the Roman Catholic is the most powerful religious body. Its membership as reported represents the entire Roman Catholic population, as compared with the

communicant members of other denominations. It is derived from various sources widely dispersed over the country. In the Northeastern States it is made up largely of Irish and French-Canadian stock, while farther West, along the shores of the Great Lakes, the Roman Catholics are principally French Canadians by birth or extraction. In Maryland they are the descendants of some of the early settlers; in Louisiana of the early French settlers: and in Texas, Arizona, New Mexico, and Southern California, the Mexican population is responsible for the strength of this denomination. The Methodist and Baptist denominations have the greatest strength in the Southern States, both among the white and colored, nearly all the colored race belonging to one or the other of them. The Presbyterians are found mainly in the Middle and Southern States and in the upper Mississippi valley. The Lutherans are a German denomination, and are found in their greatest strength wherever the German element predominates. The Christians are scattered widely over the country. The Episcopalians are found very largely in the Northeastern States, especially in New York, New Jersey, and Connecticut. The Congregationalists were formerly confined chiefly to New England, but since 1850 have increased rapidly in the Northwest. From the returns of the census of 1890 it is learned that the value of church property in 1890 was $680,000,000; the number of clergymen, preachers, etc., 108,879; and the number of communicants 20,661,046—a trifle more than one-third the population of the country, and a half of that part of the population ten or more years of age.

Education.

Elementary education is mainly provided for by public schools. The number of children enrolled in all schools, public, private, and parochial, in 1890, was 14,373,670, of whom 12,967,468 were white and 1,416,202 colored. This is about 75 per cent. of the children of school age. Of the total number entered in all schools, about nine-tenths are in the public and the remainder in about equal proportions in private and parochial schools. The enrollment in the schools is much more nearly complete in the Northern than in the Southern States, and most complete of all in Kansas, where 94 per cent. of the children of school age are enrolled, while Maine and Ohio each enrolled 93 per cent. The total number of teachers was 363,935, of which a little more than one-third were males and a little less than two-thirds were females. The total expenditure for public schools was $140,277,484, an average rate of $17 per pupil in average attendance. The amount expended per pupil in the North was, as a rule, above this average, while that in the South was below it. Of schools for higher education, including universities and colleges, there were 476, employing 11,843 professors and instructors. Of these, 2,709 were employed in the preparatory departments, 6,263 in the collegiate, and 2,871 in the professional. Of students there were in the preparatory departments 45,188; the collegiate, 60,415; and the professional, 21,265—total, 126,868. The property, including buildings and grounds, productive funds, and other items, is in excess of $220,000,000; the total income of all these institutions is $15,365,612. See Education, Schools, Common Schools, College, and University.

The following is a general summary of statistics of professional schools for 1893–94:

CLASS OF SCHOOLS.	Schools.	Instructors.	Students.	Graduates.
Theological	147	963	7,658	1,462
Law	67	621	7,311	2,454
Medical	152	4,195	21,802	5,133
Dental	35	794	4,152	877
Pharmaceutical	35	283	3,658	988
Veterinary	8	118	554	171
Nurse training	66	...	2,710	970
Totals	510	6,974	47,845	12,055

Illiteracy.—The number of illiterates was reported in 1890 as 6,324,702. This is 13·3 per cent. of the population over ten years of age. The white illiterates comprised but 7·7 per cent. of all the whites over ten years of age, while the corresponding proportion for colored is 56·8 per cent. In 1880 70 per cent. of all the colored were illiterate, showing a rapid reduction of illiteracy among this race. Of the native white population ten years of age and over, 6·2 per cent. were illiterate, while among the foreign born the percentage of illiteracy was 13·1, being more than twice as great as among the native whites. Illiteracy is much greater in the South than in the North. Among the native whites of the North, less than 3 per cent. are illiterate; among the native whites of the South the proportion is nearly 15 per cent. The State having the smallest proportion of illiterates among its entire population is Nebraska, with 3·1 per cent., and that having the largest is Louisiana, where 45·8 per cent. of the people are illiterates, due to the large proportion of colored population.

Periodicals.—According to Rowell, the total number of periodicals published in 1901 in the U. S. was 20,879. They were classified as follows by frequency of issue:

Weekly	14,827	Bi-weekly	60
Monthly	2,791	Bi-monthly	68
Daily	2,158	Tri-weekly	49
Semi-weekly	472	Tri-monthly	2
Semi-monthly	275	Semi-quarterly	2
Quarterly	175		

The total yearly issue of all periodicals is estimated at 3,481,610,000 copies, an average of 50 per inhabitant.

History.

The Colonial and Provincial Period.—The discovery of the North American continent by the Norsemen, the Spaniards, the English, and the French is sufficiently described under the titles Vinland, Norumbega, Ponce de Leon, Cabot, Soto, Champlain, Raleigh, Smith, Puritans, and the other explorers and settlers prominently connected with this early period. Under the names of the several States information concerning the settlement and colonization of particular localities will also be found. Results only can be considered here. The coming of the Norsemen in the tenth century left no permanent impression; and the only abiding influence of the discovery of Florida by the Spaniards was the Spanish claim to that territory, which was purchased by the U. S. in the nineteenth century. With the English and the French, however, the matter was very different. In a general way, it may be said that the English established permanent settlements along the coast-line from Florida to Nova Scotia; and claimed the territory extending indefinitely westward; while the French, taking the river St. Lawrence as the basis of their advances, pushed along the line of the Great Lakes and down to the mouth of the Mississippi. Thus English methods and institutions came to prevail in the eastern part of what is now the U. S., while the institutions of France established themselves in the North and West. It was inevitable that disputes concerning the boundary-lines should take place at an early day. The claims of the English and those of the French were quite irreconcilable. Both nations tried to establish lines of defense and attack along the lakes and on the Ohio river. The French were far more skillful than the English in dealing with the Indians, and consequently the Indians generally fought on the French side. King George's war (1744 and 1748) settled nothing, and the final trial of strength did not come until the French and Indian War (see French War), which was really a part of the Seven Years' War (*q. v.*), and extended from 1754 to 1763. While France was occupied in the great contest with Frederick the Great, Great Britain, which under the statesmanship of Pitt was enlisted on the other side, pushed the war in America to a definite conclusion. The defeat of Montcalm by Wolfe (*qq. v.*), and the consequent fall of Quebec Sept. 15, 1759, put the British in possession of all the territory E. of the Mississippi river.

While this long contest had been going on, the British colonies along the coast had been developing their institutions according to English methods. The colonial divisions were determined primarily by the charters received from the mother government; and as time advanced, the enterprise of the settlers and the liberality of the charters determined the size and prosperity of the respective colonies. Along the rivers and valleys colonization pushed in some regions slowly, in others rapidly, toward the West, so that at the time of the Revolutionary war each of the more important colonies S. of New England had established personal and political, as well as territorial, connections with the vast domain extending into the valley of the Mississippi. (See the article Frontier; also Roosevelt's *Winning of the West.*) In Virginia, the typical Southern colony, the charter retained large powers for the Governor, and gave few powers to the people. Not a little turbulence was the result. (See Bacon's Rebellion.) The part of the mother country was not skillfully played, and therefore when the troubles antecedent to the Revolution broke out Virginia was one of the foremost to urge a policy of vigorous resistance. South

Carolina was animated by a similar spirit. But it was in New England that the most advanced ideas prevailed. In Massachusetts and Connecticut the colonists were able for the most part to control and shape their own local and political affairs. Harvard College was founded within sixteen years after the first settlement at Plymouth, and only a little later a general school system was adopted. Similar provisions for a somewhat comprehensive system of education were adopted in Connecticut, and in the Dutch colony in New York. With many characteristics in common, the colonies had also many individual peculiarities, and thus it came about that each colony for itself built up on a basis of great liberality a system of social, educational, and political institutions that enabled it to contribute something to that great stock of political opinion which was at length embodied in the Federal Constitution. No government was ever more perfectly developed out of the past. Each colony grew up independently of the others, and so far as its charter permitted framed its government, in its own way, on the general model of British institutions. It was not strange, therefore, that when the colonies were forced to unite their interests in a common cause they brought to this service an amount of political experience and wisdom that has rarely been equalled. As the colonies derived the form and essence of their government from Great Britain, so the Federal Constitution was built out of materials furnished by the colonies.

Efforts to Unite the Colonies.—Although the political history of the U. S. begins in 1774, there had been several efforts to unite the colonies before that time. The mother country had provided no common government in which the colonies should take part, and the relations into which these occasionally entered under the stress of Dutch, French, and Indian wars were voluntary and transient. Planted along the Atlantic coast, each having its own harbors and river systems, the colonies had felt no drawings toward general union. To this statement of geographical independence an exception may seem to have existed in the case of Delaware and Pennsylvania, which, even after the legislative secession of 1703, continued under a common governor. With this possible exception no colony depended on the consent of any other for the exercise of any vital privilege. One or more of the colonies had taken advantage of superior harbors to tax the products of their neighbors going out through their ports; Connecticut and Massachusetts quarreled for a while (1647–50) over the dues levied by the former at Saybrook on goods destined for Springfield in the latter colony; Virginia and Maryland long maintained a dispute concerning their respective rights to the navigation of Chesapeake Bay and the Potomac river; while even the adoption of the Constitution has not wholly prevented controversy between New York, New Jersey, and Connecticut in the matter of the control of New York Bay, as in the case of the claim of certain patentees of New York to the monopoly of steam-navigation within those waters. But none of these issues was vital, while the exigencies of a common defense against the savages were held to be sufficiently met by an occasional common armament and joint expedition of two, three, or four contiguous colonies. One exception, indeed, is found. In 1643 the four colonies of Plymouth, Massachusetts Bay, Connecticut, and New Haven, which afterward formed two of the thirteen original States, united in a confederation, known as the United Colonies of New England, for defense against the savage tribes. In this confederation the four colonies, though very unequal in size and population, were to have equal power, but all war-expenses, which were to be a common charge, were to be apportioned according to the number of male inhabitants in each colony. Runaway servants and fugitives from justice were to be mutually delivered up, and the judgments of courts of law and probates of wills in each colony were to receive full faith and credit in every other. This confederation, thus limited in extent, had but a feeble existence, and expired after about half a century with the exigency in which it had its rise.

No other attempt at confederation was made until 1754, though in the interval colonies were temporarily or permanently consolidated by the crown, sometimes with and sometimes without their consent. In the year named a convention was held at Albany, New York, in view of the approaching hostilities with the French and Indians, and on the instance of the British Board of Trade. Commissioners were present from New York, Pennsylvania, Maryland, and the four New England colonies. Delegates were also present from the famous Six Nations of New York. Under the leadership of Benjamin Franklin, a plan of permanent union for the colonies was adopted, to be dependent for effect on the sanction of the British Parliament. The scheme comprised a president-general, named and supported by the crown, and a council of forty-eight members, to be chosen every three years by the legislatures of the colonies. Each colony was to have representation in proportion to its contributions to the general cause, no colony, however, to have less than two or more than seven members of the council. The council was to undertake the common defense, apportioning quotas of men and money therefor, controlling the forces raised, and enacting ordinances of general interest. The president-general was to have a negative on all acts of the council and the appointment of all military officers. Civil officers were to be appointed by the council, with the consent of the president. This promising scheme was, however, rejected by the Board of Trade as conferring dangerous powers on the colonies, and by the colonies themselves as giving too much authority to the crown in matters which they had jealously reserved to themselves; so that the colonies had to sustain the ensuing war, which broke the power of France upon the continent, with no other concert than that derived from the voluntary concurrence of the several legislatures or executives.

The forces which thus for more than a century withstood union were not found alone in the indifference growing out of the natural independence which has been noted. There was also a decided repugnance, if not between individual colonies, between groups of colonies, arising out of differences in race, religion, and political institutions. New England was almost purely English; the populations of the middle colonies were most curiously and variously composed of a great number of nationalities. New England was chiefly Puritan; in the middle colonies the Quakers and Lutherans dominated; at the South, the Church of England had formally established its offices. But the repugnance caused by differences of race and religion was probably less than that due to differences in the political franchises and institutions of the several sections. The charter governments of New England (excepting New Hampshire) were in strong contrast to the proprietary governments of Maryland, Pennsylvania, and Delaware and the provincial governments of the South. The political habits and aptitudes which resulted were widely diverse, especially in respect to the forms in which political power was exercised and to the modes of taxation in use. Evidence abounds that the total effect of all these causes was to produce a strong disinclination to confederation among the colonies, and especially that the Episcopal and aristocratic prejudices against the leveling spirit of New England, and the Quaker opposition to war, to which the New England colonies were from the first exceedingly prone, constituted obstacles to union which no cause but the single one which actually brought the colonies together could for more than one generation have overcome.

Causes of the War of Independence.—In 1765 the general opposition to Grenville's Stamp Act led to a congress of delegates from nine colonies, appointed by various authority, which met at New York and formed a union for the purpose of resisting taxation by Parliament. This congress, however, assumed no powers of government; its proceedings were limited to deliberation and remonstrance, and the union expired with the repeal of the obnoxious law in 1766. In 1774, however, the opposition to Charles Townshend's measures for raising a British revenue within the colonies, inflamed by the stirring events at Boston—the "massacre" of 1770 and the "tea-party" of 1773—resulted in a congress of the colonies, which met at Philadelphia on Sept. 5. Twelve colonies were soon represented, Georgia being the exception. This congress was in reality an assemblage of committees. The colonies voted as entire bodies, casting single votes, the question of proportional representation being waived for the sake of harmony. The congress undertook to exercise no coercive powers. Separation from Great Britain was not then determined on, and was not even generally in contemplation. The important measures of the congress of 1774 were a declaration which based the rights of the colonies on the laws of nature, the principles of the British Constitution, and the several charters or compacts between the colonies and the crown, and denied expressly and completely the right of Parliament to tax the colonies, though recognizing the power of commercial regulation; and, second, non-importation and non-exportation agreements, the article tea being particularly named in the

former, while rice, the product of Carolina, was specially excepted from the prohibitions of the latter. The congress adjourned in October, recommending that another congress be held in 1775, should the grievances of the colonies not meanwhile have been redressed. During the winter which followed, rapid progress was made toward revolution in Massachusetts. The Governor, on the part of the crown, dissolved the General Assembly, and called new councilors into office by mandamus, under authority of an act of Parliament revoking so much of the charter of the colony as authorized the assembly to elect the council. The Governor's councilors were compelled by a show of popular violence to resign, while a new Assembly, elected by the people in defiance of an executive proclamation, met at Salem and resolved themselves into a provincial congress, whose recommendations had all the effect of law throughout the colony. On Apr. 19, 1775, occurred the battle of Lexington, an unforeseen collision between the royal troops marching to seize military stores at Concord and the militia and citizens.

The second Continental Congress met at Philadelphia on May 10, following. Most of the delegations had been chosen before the battle of Lexington, when armed resistance to the obnoxious acts of Parliament was not in contemplation. "They were," says Mr. Bancroft, "committees from twelve colonies, deputed to consult on measures of conciliation, with no means of resistance to oppression beyond a voluntary agreement for the suspension of importations from Great Britain. They formed no confederacy; they were not an executive government; they were not even a legislative body." Such, indeed, they were in theory; but the course of events threw upon this body of committees the duties of a revolutionary congress. Blood had been shed; the British troops were besieged in Boston by the militia of New England; Congress, by the necessity of the situation, became the organ of the common resistance. A Continental army was raised; a commander-in-chief, George Washington, of Virginia, was chosen, in whose commission the phrase "United Colonies" was first used; a Continental currency was created; a general treasury and post-office established; while the whole management of Indian affairs was assumed by Congress. Here we see most of the parts of government emerge. What, meanwhile, had become of the governments of the colonies? Much stress has been placed by some writers on the fact that the revolutionary governments of the colonies were generally not organized until after the Continental Congress had assumed powers of legislation, and had recommended the establishment of new governments in the several colonies. But no inference can justly be drawn from this fact adverse to the full political rights of each colony. The priority noted was a priority in time, not in logic. It was due to the urgent military necessity of the situation, and intimated no supremacy on the part of the Continental Congress. It is not conceivable that the latter body should have assumed to disregard the entity of a single colony, even the smallest, or have proceeded to do anything authoritatively in respect to the organization of colonial governments, or to take territory from one colony for the benefit of another. The colonies in no respect owed their existence or their political rights to the Continental Congress, which was their creature, the organ of their voluntary common action.

On June 17 was fought the battle of Bunker Hill, between the garrison of Boston and the besieging provincials. Though this action was not, as now, regarded as a substantial victory for the Americans, it did much to strengthen the purpose of resistance and to quicken the growth of revolutionary ideas. The progress of the popular mind of the colonies toward independence of Great Britain was hastened by the refusal of Parliament to receive the petition of Congress; by the bombardment of the town of Falmouth, now the city of Portland; by acts of Parliament prohibiting trade with the colonies and authorizing the capture of their vessels; and by the active impressment of seamen on the North American coast. The military operations of the autumn and winter had not been decisive. The expedition of Montgomery and Arnold against Canada had resulted disastrously; on the other hand, Washington had been appointed commander-in-chief of the Continental forces, and in consequence of the skill of his manœuvers the British garrison had been compelled to evacuate Boston. A British fleet had also been beaten off Charleston in the action at Fort Sullivan.

The War of Independence.—On June 7, 1776, a resolution of independence was introduced into the Continental Congress by Richard Henry Lee, of Virginia, and referred to a committee consisting of John Adams, Thomas Jefferson, Benjamin Franklin, Roger Sherman, and Robert R. Livingston. The DECLARATION OF INDEPENDENCE (*q. v.*) was drawn by Jefferson, and on July 4, after slight modifications, was adopted and promulgated, the delegations being generally instructed to that end by the respective colonies. On the same day on which the committee was appointed to prepare the Declaration, a committee was appointed to prepare Articles of Confederation, it being fully recognized that independence of Great Britain necessitated union among the colonies, now become States. Yet this committee did not report a plan for confederation until Nov., 1777, nor were the Articles adopted by all the States before Mar. 1, 1781. During the whole of this period the States, united only by their free consent, were carrying on war with Great Britain at a distinct disadvantage by reason of the absence of authoritative government. This long delay in such an exigency affords a measure of the difficulties of union. One obstacle, however, additional to those previously mentioned, requires to be stated. Seven States, Massachusetts, Connecticut, New York, Virginia, South Carolina, North Carolina, and Georgia, owned or claimed considerable tracts of land to the W. of their present limits. The six other States objected to signing the Articles until these unoccupied lands, which were to be defended by the arms and resources of the Confederation, should be ceded for the benefit of the Confederation. This objection, however, was maintained with less vigor by some of these States than by others. Before the close of July, 1778, ten States had ratified the Articles. New Jersey acceded Nov. 26, 1778; Delaware May 5, 1779; Maryland remained out until Mar. 1, 1781. The contention of Maryland was that without such cession the States owning Western lands would pay their war expenses by sales of lands instead of by taxation; and, secondly, that when this Western territory should be settled, the communities there formed would become politically and socially the satellites of the States under whose laws and administration they had grown up. The contest was finally settled by the patriotic action of New York, which authorized (Feb. 19, 1780) its delegates to cede its Western lands. This action was accepted by Maryland as an earnest of what she had claimed, and she joined the Confederation as stated. Sooner or later all the landed States followed the example of New York—Virginia, 1784; Massachusetts, 1785; Connecticut, 1786; South Carolina, 1787; North Carolina, 1790; Georgia, 1802.

Meanwhile the war had been prosecuted without a government having coercive power. The States, when called upon by Congress for contributions of men and money, responded in their own time and way. The British troops under Sir William Howe defeated the American army on Long Island Aug. 27, 1776, and soon afterward occupied the city of New York and the country of the lower Hudson. Before the close of the year Washington had been obliged to retire beyond the Delaware river with a small, ill-provided army, but by the brilliant surprises of Trenton and Princeton the British were thrown back and New Jersey was largely recovered. During the summer of 1777 Sir William Howe transferred the greater part of his force by water to the neighborhood of Philadelphia, which city he captured, after defeating the American army on the Brandywine, Sept. 11. A bold attack by Washington on the British forces at Germantown (Oct. 4) was repulsed. At the North, however, the cause of independence found this year a better fortune. Gen. Burgoyne, in command of an army composed of British regulars, Hessians, Canadians, and Indians, in July captured Ticonderoga and Whitehall, and began a movement intended to gain possession of the Highlands of the Hudson, and by opening that river from its source to its mouth to isolate New England. The expedition, however, was wholly disastrous. A strong detachment of British was defeated by a militia force under Gen. Stark at Bennington Aug. 16, and in September Burgoyne was brought to bay near Saratoga, and after two severe actions (Sept. 19 and Oct. 7) was compelled to surrender (Oct. 17) to Gen. Gates. The battle of Saratoga has often with much reason been regarded as the turning-point or decisive battle of the war. If Burgoyne had succeeded, an open line of communication would probably have been established between Canada and New York, and New England would have been cut off from the possibility of giving active support to Washington. The failure of this brilliant project kept the colonies united and greatly embarrassed the British. Nor was this all. The victory at Saratoga gave great reputation

abroad to the American arms, and decided the French king to join in treaties of alliance and commerce with the U. S., which were signed in Paris in Feb., 1778. Meanwhile Washington had been reduced to straits in keeping the field against the British, and his army encountered the greatest hardships during the winter of 1777–78 at Valley Forge, a day's march N. of Philadelphia. The want of an authoritative government was severely felt in the slow and partial responses made by the States to the requisitions of the Congress. In this strait the issue of bills of credit was resorted to. The depreciation was of course rapid. Mar. 1, 1778, $1 in specie exchanged for $1.75 in paper; Sept. 1, for $4; Mar. 1, 1779, for $10; Sept. 1, for $18; Mar. 18, 1780, for $40; Dec. 1, for $100; May 1, 1781, for $200–$500. During the operations of 1778 the co-operation of the French fleet under d'Estaing proved delusive, but the conduct of the British armies was ineffective; Sir Henry Clinton, who succeeded Howe, evacuated Philadelphia and retired on New York. During the movement an indecisive action was fought at Monmouth, the army of Washington remaining in possession of the field. The British forces still held Rhode Island, which they had occupied two years before. Toward the close of 1778 Sir Henry Clinton sent a force against the city of Savannah, which fell Dec. 29. This result turned toward the South the efforts of both armies. During the summer of 1779 the British overran the whole of Georgia, but were compelled to abandon Rhode Island in view of an expected expedition of the troops and fleets of France and Spain, the latter country having declared war against England in June. In September the Americans under Lincoln, assisted by the French fleet, made a futile attack on Savannah, being repulsed with heavy loss. In Apr., 1780, Clinton in person invested Charleston, which was held by Gen. Lincoln. The defense was weak, and the city was surrendered with the garrison in May; South Carolina was completely overrun, and Cornwallis, who was left in command by Clinton, threatened North Carolina. In this emergency troops were detached from the Northern army under the command of Gen. Gates, who was re-enforced by the militia of Virginia and North Carolina, but was routed with great loss at Camden, while the patriotic corps of Sumter, who since the conquest of South Carolina had not ceased to harass the British outposts, was destroyed by Tarleton on the banks of the Wateree. The three southernmost States were now held by the British, while to the disaster at the South was nearly added the capture of the strongholds on the Hudson through the treachery of Benedict Arnold. In October, however, a considerable detachment of the British army was destroyed by militia at King's Mountain, inducing Cornwallis to retire into South Carolina; and in December Gen. Greene arrived from the North, superseding Gates. The close of the year found Holland also in arms against Great Britain, though not taking part in the military operations in America.

The campaign of 1781 was destined virtually to close the war in favor of the Americans. Jan. 17 the British, under Col. Tarleton, were defeated at Cowpens, S. C., by Gen. Morgan; Mar. 15 a severe action was fought at Guilford Court-house between Greene and Cornwallis, by which the British, though they held the field, were so far weakened that they were compelled to retire; on Sept. 8 was fought the severe action of Eutaw Springs, in which the Americans had the advantage. The effect of these actions, combined with the activity of the American partisans under Marion, was to compel the abandonment of North Carolina and nearly all of South Carolina by the British, who were content to hold a few places by garrisons. Meanwhile Cornwallis, moving into Virginia with a view to forming a junction with Sir Henry Clinton, was hemmed in at Yorktown by the troops of Washington and Rochambeau, and after a siege of about three weeks was compelled to surrender his whole force, about 8,000 men, Oct. 19. The surrender of Cornwallis practically ended the war. No operations of importance followed. In July, 1782, the British evacuated Savannah; a preliminary treaty of peace was signed Nov. 30 of that year at Paris; Dec. 14 Charleston was evacuated; the definitive treaty was signed Sept. 3, 1783; New York was evacuated by the close of November; in December WASHINGTON (*q. v.*) resigned his commission as commander-in-chief.

The Confederation.—The Government which, as recited, had been brought into existence Mar. 2, 1781, remained in effect during two years of war and six years of peace. Its constitution is given in full under the title CONFEDERATION, ARTICLES OF. It was early shown to be a hopeless failure. It had no coercive power over States or individuals. The Congress could not even command the attendance of its own members. In consequence, the States ordinarily neglected or refused to comply with the requisitions of Congress, and settled their disputes or contended over them without regard to the authority of the U. S.; while Congress itself sank to be, in the language of Mr. Curtis, "a feeble junta of about twenty persons," moving about from city to city as circumstances required.

On Feb. 21, 1787, Congress called upon the States to send delegates to a convention at Philadelphia for the purpose of revising the Articles of Confederation, "to render the Federal Constitution adequate to the exigencies of the Government and the preservation of the Union." The convention met in May, George Washington being president. Among the most eminent members were Benjamin Franklin, Alexander Hamilton, James Madison, Edmund Randolph, George Mason, James Wilson, Gouverneur Morris, John Rutledge, Charles C. Pinckney, Rufus King, and Roger Sherman. Rhode Island was not present by delegates. It was long doubtful whether the conflicting interests could be brought to agreement. The small States feared they would lose their identity; the large ones that they would be deprived of their superiority. This difficulty was settled by giving the small States equal representation in the Senate and the larger ones the advantage of representation in the House of Representatives on the basis of population. A still more difficult question was that of slavery, and it is safe to say that but for the spirit of concession on both sides, the North and the South could not have been brought into a single Union. Then there were radical differences of opinion as to the nature of the Government to be established. Hamilton desired a strong central power, while, at the other extreme, the followers of Jefferson insisted upon the recognition of State sovereignty. Both sides made concessions, and a final agreement was reached. The question, however, as to the relative authority of the Federal Government and the individual States was not conclusively determined. If it had been, it is hardly probable that the Constitution, even if adopted by a majority of the delegates, would have been ratified by the States. The convention was dissolved in September, having submitted a form of constitution essentially different from the Articles of Confederation. The main features of the plan of government thus proposed are given in this article under the title *Government*; see also the article CONSTITUTION OF THE UNITED STATES. The order of ratification by the conventions of the States was as follows: Delaware, Dec. 7, 1787, unanimously; Pennsylvania, the same day, by a vote of 46 to 23; New Jersey, Dec. 12, unanimously; Georgia, Jan. 2, 1788, unanimously; Connecticut, Jan. 9, by a large majority; Massachusetts, Feb. 7, 187 to 168; Maryland, Apr. 28, 63 to 11; South Carolina, May, by a large majority; New Hampshire, June 21, 57 to 46; Virginia, June 25, by a majority of 10; New York, July 26, 30 to 27. The ratification of nine States being sufficient, the new Government went into operation before Rhode Island and North Carolina had acceded, which they did shortly after. Ten amendments to the Constitution were immediately proposed and adopted, constituting a sort of Bill of Rights desired by some of the ratifying States.

Inauguration of the Federal Government.—The new Government was inaugurated, nominally, on Mar. 4, really on Apr. 6, 1789. George Washington, of Virginia, was found to have received the entire number of votes in the electoral college, and was declared President; John Adams, of Massachusetts, having received a plurality of second choices, was declared Vice-President. The cabinet was announced as follows: Thomas Jefferson, Secretary of State; Edmund Randolph, Attorney-General; Alexander Hamilton, Secretary of the Treasury; Henry Knox, Secretary of War. At the election party distinctions had not been formulated, though it was not to be doubted that the divisions of sentiment which had been developed in the constitutional convention would eventuate in the formation of parties under the Constitution. The cabinet even gave testimony to fundamental differences of political belief between North and South. Hamilton and Knox were pronounced advocates of what became known as Federalism; Jefferson and Randolph were strong asserters of those views of the powers of the general Government, and of its relations to the States, which characterized the Anti-Federalist party.

The Formation of Political Parties.—Two measures of Washington's first term especially promoted the division of

the country by party lines. These were the creation of a national bank by act of Congress, and the assumption by the U. S. of the war debts of the several States. The former measure was opposed in the cabinet by Jefferson and Randolph, and supported by Knox and Hamilton, the latter being the author of the scheme. Washington, who had strong Federal associations and proclivities, though disowning party obligations, gave the bill his approval. The bank went into operation in 1791, the charter having twenty years to run. The State debts were assumed in a limited amount ($21,500,000) after an embittered contest in Congress, in which the party asserting the utmost fullness of national powers under the Constitution triumphed. During the administration of Washington the U. S. progressed steadily toward industrial and financial prosperity, and entered into diplomatic relations with several of the principal powers of Europe. War was, however, waged with the Miami confederation of the Ohio, over which, after two successive disasters to the armies under Gens. Harmer and St. Clair, Gen. Anthony Wayne, the hero of Stony Point in the Revolutionary war, won a decisive victory, which led to peace and the cession of nearly the whole of Ohio by the Miamis in 1795. No opposition was made to the re-election of Washington in 1793, but during his second term the antagonism of the Federalists and Anti-Federalists (now called Republicans) became intense. The Republicans sympathized strongly with the progress of the Revolution in France; and the more forward, incited by the acts and appeals of Genet, minister from France, strove to commit the U. S. to an active support of that cause, which the Federalists, who were popularly charged with English sympathies, as strongly opposed. The treaty negotiated by Chief Justice Jay as special envoy to England was resented by the Republicans as a surrender of American rights, and the debates thereon in Congress were marked by extraordinary bitterness. This treaty, while it secured the surrender of the posts in the Western territory held by Great Britain for twelve years in violation of the articles of the treaty of peace in 1783, left other questions open to remain the cause of alienation and dissatisfaction, to ripen many years later into war. The financial policy of Congress, which was controlled by the Federalists, also encountered much factious opposition from the Republicans, which culminated in 1794 in open rebellion against the whisky tax in Western Pennsylvania, only suppressed by the levy of the militia of Maryland and Pennsylvania. (See WHISKY REBELLION.) The increasing bitterness of feeling in the second term of Washington led to the disruption of his cabinet, in which the eminent statesmen who originally constituted it were finally replaced by Oliver Wolcott, Secretary of the Treasury; Timothy Pickering, of State; James McHenry, of War; Charles Lee, Attorney-General.

At the presidential election of 1797, Washington declining to be a candidate, Jefferson was supported by the Republicans and Adams by the Federalists. The latter was elected by a vote of 71 to 68. As the second choices of the Federalists were divided, Jefferson, receiving the highest number next to Adams, became, under the Constitution as it then was, the Vice-President and the leader of the opposition. Adams's administration was an unfortunate one throughout. He mistakenly retained Washington's secretaries, who either gave him no hearty support or intrigued against him in the interest of Hamilton. Adams was finally compelled to dismiss Pickering and McHenry. The President further alienated his own party by renewing negotiations with France after that power, deeming itself outraged by the Jay treaty with Great Britain, had ordered the U. S. minister out of her territory. Further than this, she had insulted the special envoys, Marshall, Pinckney, and Gerry, who had been sent to adjust the difficulties which threatened war between the two powers to the extent that both nations prepared for action, and captures and conflicts occurred on the ocean. In the U. S. the war-spirit ran so high among the Federalists, especially those who supported Hamilton, that the course of the President in dispatching other envoys on what was deemed insufficient evidence of the better disposition of France, provoked deep hostility to Adams, and was an important cause of his subsequent defeat. The embassy was, however, successful, and a treaty was concluded in 1800. But while Adams was thus alienating sections of his own natural supporters, the Federal party as a whole was sowing the wind from which it was to reap the whirlwind by the enactment in Congress, which that party still controlled, of the Alien and Sedition laws—acts authorizing the summary removal by the executive of suspected aliens, and providing severe penalties for seditious publications. These measures, which were an excellent imitation of those by which Pitt was striving to keep down the growth of revolutionary sentiments in England, were resented as inconsistent with the genius of republican institutions, and led to the famous declarations of the right of nullification known as the Virginia and Kentucky Resolutions (see NULLIFICATION) of 1798–99, those of Virginia being drawn by Madison, those of Kentucky by Jefferson. During the preparations for war with France in 1798, the Navy Department was created, and Benjamin Stoddert, of Maryland, was appointed secretary. The policy of maintaining a large naval force had always been advocated by Adams from the earliest days of the Revolutionary war.

At the fourth presidential election Adams was defeated, receiving only 65 votes against 73 for Jefferson. As, however, Aaron Burr, the intended Vice-President, received also 73 votes, there being no designation on the ballots as to which should be President and which Vice-President, the election was thrown into the House of Representatives, where the States, in such an event, have equal power, each casting a single vote. After thirty-five ballots, in which the Federalists, in order to defeat Jefferson, who was peculiarly obnoxious to them, supported Aaron Burr, Jefferson received the votes of ten States and was elected; Mr. Burr became Vice-President. This contest led to the adoption of the 12th Amendment to the Constitution, which provided that the candidates for President and for Vice-President should be voted for separately.

Accession of Anti-Federalists.—The defeat of the Federalists had been decisive—so much so that Mr. Jefferson was accustomed to speak of "the revolution of 1800" in referring to the election of that year; and in 1804 Jefferson was re-elected, with George Clinton as Vice-President, the Federalist candidates receiving but 14 votes against 162. Jefferson's cabinet consisted of James Madison, Secretary of State; Samuel Dexter, of the Treasury; Henry Dearborn, of War; Benjamin Stoddert, of the Navy; and Levi Lincoln, Attorney-General. Dexter was afterward replaced by Albert Gallatin, and Stoddert by Robert Smith. Consistently with his theory of government, Jefferson sat and voted with the secretaries in cabinet session upon equal terms, so that the executive resembled a directory. The President and his cabinet were, however, perfectly harmonious, and the Republican party continued to gain power rapidly in every section. The principal measures and events of Jefferson's administration concerned the foreign relations of the U. S.

In 1801 war was declared against the U. S. by the Bey of Tripoli, to whom the U. S. had paid tribute for the privilege of navigating the Mediterranean. Hostilities continued with slight practical result, though much to the credit of the American navy, till peace was made in 1805. In 1803 Robert R. Livingston and James Monroe, as envoys of the U. S., concluded a treaty with Napoleon, by which the whole of the vast possessions of France W. of the Mississippi, embracing, as computed, 1,171,931 sq. miles, were ceded to the U. S. for about $15,000,000. This purchase, admitted by Jefferson to have been made by a great stretch of constitutional authority, was a remarkable act of concession to the principles of the Federalists; but the immeasurable advantage to be gained by the undisputed possession of the Mississippi river and all the territory W. of it were enough to induce even Jefferson to set aside his doctrine of strict construction. This cession greatly exasperated Spain, who deemed her possession of Florida threatened thereby. Friendly relations between the two nations were interrupted, and some acts of hostility took place. In her desperate efforts to stay the progress of Napoleon, then fast overrunning the continent of Europe, Great Britain at that period exercised with unwonted severity her always disputed rights of search and impressment. Napoleon, seeking to effect the commercial isolation of Great Britain and the independence of continental Europe, issued successive decrees from Berlin, from Milan, and from Rambouillet. (See NAPOLEON.) These decrees, together with the retaliatory orders in council issued by Great Britain in 1807, were without a shadow of justification in the law of nations, and were peculiarly oppressive to American commerce. But while France and Great Britain were equally in the wrong as regarded their attitude toward the U. S. as a neutral power, the superior naval force of Great Britain rendered her course practically the more injurious. It was this view which constrained Jefferson and his successor more and more to overlook the wrongs done by France, and to seek to direct the public thought of the nation toward Eng-

land as the real enemy of the U. S., though at times the suggestion of a "three-cornered war" was made with more or less seriousness. In 1806 James Monroe and William Pinkney, as envoys, negotiated a treaty with Great Britain, by which it was sought to remove or reduce the points in dispute, but the treaty was rejected as insufficient by the President without reference to the Senate. In 1807 occurred the affair of the Chesapeake and the Leopard, which did much to arouse those feelings of exasperation which made war possible. A British frigate, in asserting the British claim to recover British seamen wherever found, attacked a U. S. public armed vessel in U. S. waters, and after compelling a surrender took off four seamen. Reparation for this act was delayed four years. In Dec., 1807, on the recommendation of the President, an embargo was declared by Congress, all vessels being prohibited from sailing for foreign ports, while the coastwise trade was placed under stringent restrictions. This policy was continued until Mar. 1, 1809, the commercial interests of the country suffering meanwhile the deepest distress. The blow fell with especial severity on New England, where the exasperation of the community was carried almost to the point of open resistance to the law. Three days after the repeal of the embargo—which, though still approved by the President, could no longer be sustained against the force of public feeling—Mr. Jefferson, having declined re-election, went out of office, leaving the settlement of the disputes with England to his successor, James Madison, of Virginia, who had long been his pupil in politics and his Secretary of State during the eight years of his administration. Mr. Madison, with George Clinton for Vice-President, had been elected in 1808 over the Federal candidates, Charles C. Pinckney and Rufus King, by a nearly three-fourths vote. The cabinet was constituted of Robert Smith, Secretary of State; Albert Gallatin, of the Treasury; William Eustis, of War; Paul Hamilton, of the Navy; Cæsar A. Rodney, Attorney-General. For the embargo prohibiting all foreign trade were now substituted acts prohibiting trade with England and France, but containing provisions intended to induce one of those powers to seek a restoration of intercourse at the expense of the other. This policy of inviting the belligerents to bid against each other for the privilege of open trade with the U. S. was continued through three years, with the effect that France, after one ambiguous announcement—which the Republican party welcomed as satisfactory, while the Federal party and the British minister denounced it as insufficient and insincere—repealed her obnoxious decrees. Great Britain followed by a repeal of her orders in council; but five days before—viz., on June 18, 1812—Congress had declared war upon the recommendation of President Madison, who, though personally averse to extreme measures, was urged forward by younger men now rising into power, notably Henry Clay and John C. Calhoun. The arrival of the news of the repeal led to a renewal of negotiations, but the U. S. feared to give time for the strengthening of the fortifications of Canada, and hostilities commenced.

The War of 1812.—The war was to be fought upon the very issues which had been evaded in the Jay treaty of 1794, but the eighteen years that had elapsed had brought a great gain of numbers and resources to the U. S. The population had grown from 4,500,000 to 8,000,000, and the wealth of the nation had trebled or quadrupled in the interval. The number of States was now eighteen, Vermont having been admitted in 1791, Kentucky in 1792, Tennessee in 1796, Ohio in 1802, Louisiana in 1812. The war was fought on three faces—viz., along the lakes, on the North Atlantic shore, and along the Gulf of Mexico. It opened in the N. by the invasion of Canada from Detroit by Gen. Hull, Governor of the Territory of Michigan. In about a month Hull had surrendered his entire force without fighting, and Michigan and parts of Ohio were overrun by the British, whose progress was withstood by Gen. William Henry Harrison, who in the preceding year had earned distinction by defeating the Shawnees under their chief TECUMSEH (*q. v.*) and his brother the Prophet. The campaign of 1813 gained little credit to the American arms. Gen. Jacob Brown successfully defended Sackett's Harbor, and Harrison routed the British and their savage allies on the Thames, killing Tecumseh; but other attempts at invasion by Wilkinson and Hampton resulted in disgraceful retreats, while the British overran Western New York and burned several towns in retaliation for the burning of Toronto (then York). In September, however, Lieut. OLIVER H. PERRY (*q. v.*), of the U. S. navy, in command of an extemporized fleet, defeated and captured the British squadron, giving the Americans complete control of Lake Erie. The campaign of 1814 witnessed a marked change. On the one hand, the British forces in Canada were heavily re-enforced by veteran troops from Europe; on the other, the American soldiery were acquiring discipline, and able young commanders were coming to the front. Under Jacob Brown and Winfield Scott the Americans won the victories of Chippewa and Bridgewater (or Lundy's Lane). On the other end of the Canada line the invasion of a powerful army under Sir George Prevost was defeated through the destruction, off Plattsburg, of the supporting squadron by an American fleet under MacDonough. This practically closed the war on the northern frontier. On the Atlantic coast the years 1812 and 1813 were marked by the gallant efforts of the six or eight U. S. frigates, and as many sloops of war, to sustain themselves against the numerous cruisers, and, later, the powerful fleets, of Great Britain. In spite of victories in single combat which reflected the highest credit on American seamanship and courage, the few armed vessels of the U. S. were one by one captured by superior force or blocked up in the northern harbors, and in 1814 the British fleets cruised without serious opposition along the whole coast, depredating and destroying at will, though American privateers still swarmed over the seas inflicting great damage upon British commerce. In Aug., 1814, a British army under Gen. Ross, supported by a powerful fleet under Admirals Cockburn and Cochrane, captured Washington after an insignificant conflict at Bladensburg, and burned the Capitol and the President's mansion. In September the same force attacked Baltimore, but both the army and the fleet were beaten off, Gen. Ross being killed at North Point. The third theater of war was at the Southwest. The Creeks of Alabama having taken up arms, Gen. Andrew Jackson with a body of Western levies invaded their country, and defeated them with great slaughter at Tohopeka in Mar., 1814, compelling the cession of the larger part of the Creek lands. In the summer of the same year a British party occupied Pensacola, then claimed by the Spaniards, and later assaulted unsuccessfully Fort Bowyer near Mobile. In December the British advanced to a formidable attack on New Orleans, and Jackson prepared for its defense. A night attack was made (Dec. 23) on the British camp, for which considerable effect has been claimed; but on Jan. 8, 1815, the British commander, Pakenham, advanced with a greatly superior force of Wellington's veterans against the U. S. lines, and was repulsed, he himself, his second in command, and 2,600 men falling in the attack, while the U. S. loss was less than 100. Never had a British army been so disastrously beaten. Meanwhile peace had already been concluded at Ghent, Dec. 24, 1814. By the articles of the treaty all conquests on both sides were to be restored, while the questions of search and impressment, concerning which the war had been begun, were not mentioned. See GHENT, TREATY OF.

The Rise of New Issues.—With the war of 1812–15 closed what may be called the first era of the political history of the U. S.—the era when the foreign relations of the country engrossed public attention. The second era, which extended from 1816 to 1843, was the era in which financial and industrial questions assumed supreme importance before the country, and gave purpose and passion to party. The war with Great Britain had, by cutting off the foreign supply, called into existence considerable manufactures of iron, of cotton, and of wool, which on the return of peace were threatened with destruction. Moreover, Great Britain had, by the corn-laws of 1815, set the example of attempting to stereotype war prices for the time of peace. At this time a strong impulse to protection came from the South, where the cotton-planting interest desired the creation of a home market. Upon the recommendation of President Madison, and under the leadership of Calhoun and Lowndes, of South Carolina, the first distinctively protective tariff of the U. S. was enacted in 1816. The charter of the first U. S. Bank had expired in 1811 without renewal. The second, with a capital of $35,000,000, one-fifth owned by the Government, which had a corresponding share in the direction, was chartered by Congress, after a severe struggle, in 1816.

The course of the Federal party had been downward. At the elections of 1812 the imminence of war and the unpopularity of the Embargo and Non-intercourse Acts had given them a temporary strength, and at the election of that year they had polled 89 electoral votes for De Witt Clinton against 128 for Madison, with whom was elected Elbridge Gerry, of Massachusetts, as Vice-President. But the opposition of

the Federalists during the war, as shown in the refusal of the Federal governors of two States to allow their militia to march at the orders of the national executive, and in the holding of the HARTFORD CONVENTION (*q. v.*) in Dec., 1814, at which measures for restricting the authority of the general Government were discussed, and which was charged with being in the interest of a separate New England confederation, practically destroyed the party. At the election of 1816 James Monroe, of Virginia—who, upon the resignation of Robert Smith on the ground of his opposition to the war with Great Britain, had become Secretary of State in 1811—was elected President by 183 votes, against 34 Federal votes for Rufus King, all from the States of Massachusetts, Connecticut, and Delaware. At the election of 1820 Monroe received every electoral vote but one, and the so-called era of good feeling began, with party lines wholly obliterated. Daniel D. Tompkins, of New York, was chosen Vice-President. Mr. Monroe constituted the cabinet as follows: John Quincy Adams, Secretary of State; William H. Crawford, of the Treasury; John C. Calhoun, of War; Benjamin W. Crowninshield, of the Navy; William Wirt, Attorney-General. One of the earliest important events of Monroe's administration was Jackson's successful expedition against the Seminoles in 1818. This arose from depredations committed by the Indians residing in the Spanish territory of Florida upon the frontier settlements of Georgia and Alabama. Gen. E. P. Gaines, in command of U. S. troops at Fort Scott, attacked the Indians, who avenged themselves by a massacre of a body of whites on the Appalachicola river and threatened Gaines's garrison with superior forces. Jackson was ordered to take the field, and, believing that the outrages were incited by British subjects under the protection of the Spanish authorities, carried the war into Florida, captured the Spanish post of St. Mark's, and seized the persons of two British subjects, Arbuthnot and Ambrister, suspected of having incited the Indians against U. S. citizens. These men were court martialed, found guilty, and executed. This provoked much indignation in Great Britain and Spain. The Spanish minister protested against the invasion of Florida, but the U. S. Secretary of State, J. Q. Adams, fully sustained Jackson's conduct. Other noteworthy events of the administration were (1) the cession of Florida, embracing about 60,000 sq. miles, by Spain in 1819, for the sum of $5,000,000; (2) the enunciation by the President, in his annual message in 1823, of the so-called MONROE DOCTRINE (*q. v.*)—that is, that all attempts of European governments to acquire new territory on the American continent, or to reconquer provinces that had achieved independence, would be regarded as hostile acts, the declaration being especially aimed at Spain, whose South American colonies had revolted, and had been acknowledged as republics by the U. S.; and (3) the enactment of the tariff of 1824, by which the system of protection to U. S. manufactures was extended and fortified. But the chief political measure was the Missouri Compromise. It was the era of new States. Indiana had been admitted in 1816, Mississippi in 1817, Illinois in 1818, and Alabama in 1819. After the preliminary steps had been taken for forming a State government in Alabama, Missouri applied for admission. Of the nine States already admitted since 1789, four had been free States, five slave States. It was now claimed to be the turn of the free States. Great opposition was made to the admission of Missouri with slavery; intense feeling became aroused North and South, and threats of disunion were loudly made. Various propositions for compromise were rejected, but the admission of Maine in 1820 as a free State, formed out of the territory of Massachusetts, prepared the way for an amicable adjustment, and a compromise was reached by which Missouri was admitted as a slave State, while slavery was for ever prohibited in all unorganized territory N. of 36° 30′. This was the first, and one of the most bitter, of the struggles relating to slavery under the Constitution.

At the presidential election of 1824 four candidates, all calling themselves Republicans, were voted for in the electoral college. Andrew Jackson, of Tennessee, received 99 votes; John Quincy Adams, of Massachusetts, 84; William H. Crawford, of Georgia, 41; Henry Clay, of Kentucky, 37. The election devolved upon the House of Representatives, whose choice was by the Constitution confined to the three highest candidates. Clay being thus thrown out, his friends united with those of Adams, and the latter was elected, receiving the votes of thirteen States, while seven voted for Jackson and four for Crawford. This unexpected alliance of Clay and Adams, taken in connection with the appointment, which followed, of the former as Secretary of State, led to the charge of "a corrupt coalition," which was urged with great bitterness at the time, and was reiterated at a subsequent period, but appears not to have been justified by the facts. The correspondence of Clay, Jackson, and Buchanan, together with the speeches in Congress on the subject, form a conspicuous feature in the political literature of the U. S. The other members of the cabinet were Richard Rush, Secretary of the Treasury; James Barbour, of War; S. L. Southard, of the Navy; William Wirt, Attorney-General. The chief events and measures of Adams's administration were—1, the appointment, against violent opposition in Congress, of envoys to represent the U. S. at Panama in a proposed congress to be composed of representatives of the principal American states—a scheme in the spirit of the Monroe doctrine, but which was abandoned through, first, the death of the U. S. envoy, and subsequently through revolutions in Central America; 2, a controversy with the State of Georgia, arising out of the action of the general Government in protecting the Creek Indians against the efforts of the State authorities to extrude them under cover of a pretended treaty, during which Gov. Troup threatened open war and the State militia was embodied; 3, a series of complications, resulting, fortunately, in the negotiation of the Gallatin treaty, by which trade was opened between the U. S. and the British West Indies; and 4, the tariff of 1828 known as the "act of abominations" (see TARIFFS), by which the protective system instituted in 1816 and extended in 1824 was carried to a much higher point, the feeling of the sections on this question being now reversed—New England, under the lead of Daniel Webster, advocating high duties, while the South, under the lead of Calhoun, who was the virtual author of the tariff of 1816, denounced the existing system and its proposed extension as unconstitutional.

Adams, a former Federalist, and the son of a Federal President, had been elected President in 1824, the distinction of Federalist and Republican being no longer formally maintained. But grave differences of political feeling and of constitutional theory did not lose their power for want of names to characterize them. From the day of Adams's election he was the subject of unceasing attacks having in view his defeat in 1828. Especially in the Senate, where the ablest leaders were in opposition, was the war of resolutions, motions, and speeches most fiercely carried on. The President, on his side, instead of assuming the initiative, promptly occupying the field, and by the use of his power and patronage recruiting as largely as possible that as yet unnamed political entity which was to become known as the Whig party (see WHIG), sought to remain the President of the whole country. As a result, the opposition by its aggressiveness won over all the loose elements of the political field, especially among young men having no party traditions, and acquired at this time that power and cohesiveness which has characterized the DEMOCRATIC PARTY (*q. v.*). At this period the word "Democrat," which at an earlier date had been almost a term of offense, assumed by only the most advanced French sympathizers, had come to supplant the word "Republican." At the election of 1828, Adams, styling himself a National Republican, was defeated by Gen. Jackson, who received 178 out of 261 votes in the electoral college. Calhoun, who in 1824 had been elected Vice-President with Adams, was re-elected. The cabinet was constituted of Martin Van Buren, Secretary of State; Samuel D. Ingham, of the Treasury; John H. Eaton, of War; John Branch, of the Navy; John M. Berrien, Attorney-General. Heretofore, the Postmaster-General had not been a member of the cabinet, but Gen. Jackson now appointed William T. Barry Postmaster-General, with a seat at the council-board. Immediately, the maxim "to the victors belong the spoils" was put in force. Hundreds of removals from office took place in the first six months of this administration, and the civil service became, as it long remained, prostituted to the purposes of party. See CIVIL SERVICE AND CIVIL SERVICE REFORM.

The Southern States had been deeply dissatisfied with the tariff of 1828, having become convinced that a home market for their cotton crop was a matter of indifference, while the protection of cotton, woolen, and hempen goods, and of iron manufactures at the North was in no small degree at their expense. South Carolina and Georgia had, as States, formally protested against a tariff for protection as unconstitutional. In 1832 South Carolina held a convention

which proceeded to "nullify" the obnoxious acts as an invasion of the rights of the State. (See NULLIFICATION.) The ground of the "nullifiers" was that of the resolution of 1798–99—viz., that there being "no common judge" between the States and the nation (the office of the Supreme Court, in this regard being denied), each State remained the proper judge for itself both "of the fact of an infraction" of the terms of "the Federal compact" and "of the mode and measure of redress." The tariff acts were declared null and void, the collection of customs duties within South Carolina was prohibited, and the convention announced that any attempt by the U. S. to enforce such collection would be deemed a dissolution of the Union. It was in this emergency that Jackson issued his famous proclamation, drawn by Edward Livingston, who had succeeded Van Buren as Secretary of State, in which the rights and powers of the Government of the U. S. were asserted in the fullest degree. Everything portended war. The Governor of South Carolina put the State in a condition for defense, while U. S. troops were forwarded to re-enforce the garrison of Charleston. At this juncture Virginia offered her mediation, in the very act of doing so corroborating the position of South Carolina, that a State may assert itself, by its own agencies, against the general Government, instead of seeking redress and relief through the Supreme Court. At the same time, Henry Clay, in the Senate, appeared as the advocate of concession, and succeeded in carrying through the compromise tariff of 1833, by which the duties of 1828 were to be reduced in ten years, by a sliding scale, to a general rate of 20 per cent. This concession and the mediation of Virginia were accepted by South Carolina, and the ordinance of nullification was repealed.

The second Bank of the U. S., chartered, as has been said, in 1816, for twenty years, had still seven years to live when Gen. Jackson was inaugurated, but its doom was sealed. The President's hostility was shown in his first message, and the bill for recharter which passed Congress in 1832 was vetoed. In the face of favorable reports from the Treasury and from committees of both Houses of Congress, Gen. Jackson determined that the U. S. deposits should be withdrawn. This, however, by law, could be the act of the Secretary of the Treasury alone. Louis McLane, who had succeeded Ingham in the Treasury Department, and had shown himself moderately favorable to the bank, had opportunely been translated to the State Department. William J. Duane, who succeeded, refused to do the President's bidding in the matter of the deposits, and was replaced by Roger B. Taney, who had succeeded Berrien as Attorney-General in the general cabinet overturn of 1831. Taney did the task for which he was appointed, and in 1833 the Government deposits were placed in State banks. The U. S. Bank, as a national institution, had received its deathblow; after a brief struggle against the enmity of the administration, it accepted a charter from Pennsylvania, but after the great financial storm of 1837–39 it suspended specie payments (Feb., 1840), and soon afterward its affairs were wound up. The bank was charged by Gen. Jackson with many technical violations of its charter, with expending money for political purposes, and with using its vast power of discount with favoritism toward some and malignity toward others.

Gen. Jackson had been re-elected in 1832 by 219 electoral votes, against 49 for Henry Clay, of Kentucky, 11 for John Floyd, of Virginia, and 7 for William Wirt, of Maryland, the last-named being the candidate of the anti-Masonic party. Martin Van Buren, of New York, became Vice-President. For years, under the high tariff of 1824 and the higher one of 1828, together with the large sales of public lands, the revenue had been in excess of the ordinary expenditures by 25, 50, and even 100 per cent. As a result, the public debt, which at the close of the war in 1815 had amounted to 127,000,000, was rapidly reduced, and in 1835 was extinguished. This excess of revenue had proved a powerful weapon in the hands of the advocates of tariff reduction in the struggle of 1828–33. It now became a serious embarrassment to the administration. What to do with the surplus was the great question of 1833–36. In the latter year the monstrous expedient of depositing $28,000,000 in the several State treasuries was resorted to. The division of this sum was according to population, although the money, having been largely raised by indirect taxation, had originally been contributed according to the consumption of taxed articles, which varied greatly among the several States and sections. The occurrence of the financial crisis in 1837 relieved the Government from any further embarrassment of this nature.

During the administration of President Jackson the two domestic questions of Masonry and slavery led to great agitation of the public mind. The abduction and presumed murder of Morgan in New York for betraying the secrets of the Masonic order led to the formation of an anti-Masonic party, which, however, proved unable to sustain itself in the face of a more exciting issue. No political party was yet formed adverse to slavery; but anti-slavery societies had commenced the agitation of the subject at the North and the "moral invasion of the South" through pamphlets and newspapers, leading to many riotous acts, and to efforts, through Congress and the administration of the post-office, to suppress the circulation of "incendiary documents." Two Indian wars—one (1832) known as the "Black Hawk war," against the Sacs and Foxes of the Northwest, the other (1835–39) against the Seminoles of Florida under their leader OSCEOLA (*q. v.*), extending later to the Creeks—had their origin in the prosecution of the policy started by President Monroe of removing the Indians W. of the Mississippi. In each the Indians were subdued, though in the latter case not without some dishonor to the U. S. on the score of treachery. The foreign policy of Gen. Jackson was throughout vigorous. Denmark, Naples, Spain, and Portugal satisfied claims of long standing for spoliations on U. S. commerce, while France, after diplomatic complications which at one time threatened war, paid over $5,000,000 on account of depredations committed more than thirty years before.

Gen. Jackson, though declining a third term in deference to the example of his predecessors, was able to determine the succession; and Martin Van Buren, of New York, was elected President in 1836, receiving 170 votes against a divided opposition—now known as the Whig party, corresponding in many features to the Federal party of the earlier time. William Henry Harrison, of Ohio, received 73 votes, Hugh L. White, of Tennessee, 26, Daniel Webster, of Massachusetts, 14, Willie P. Mangum 11. No one having received a majority of the votes for Vice-President, Richard M. Johnson, of Kentucky, was chosen by the Senate out of the two highest names on the list, this being the only occasion on which the Senate has been so called to act. Upon Van Buren's administration fell the financial distress which had been generated in the preceding administration, whether due, as the Whigs claimed, to the removal of protection from U. S. manufactures by the compromise tariff of 1833, to the shock given by the war on the bank, and the excess of worthless issues by the State banks when that great regulative institution was destroyed, or due, as the Democrats claimed, to the speculation induced by the operations of the bank before the deposits were withdrawn, which operations, in their opinion, justified that withdrawal. In May, 1837, the banks of New York and other cities suspended payment, and widespread bankruptcy ensued. A second and more severe commercial shock occurred in 1839. The ordinary agencies of trade and exchange were largely destroyed, industry was paralyzed, and the revenue of the Government fell sharply off. It was not until 1842 that prices and wages reached the minimum, and a revival of business with a restoration of confidence began. During the later years of this crisis eight States in whole or in part repudiated their obligations, either as to the interest or the principal. Except Lewis Cass, Secretary of War, Mr. Van Buren retained all the members of Gen. Jackson's latest cabinet—namely, John Forsyth, Secretary of State; Levi Woodbury, of the Treasury; Mahlon Dickerson, of the Navy; Benjamin F. Butler, Attorney-General; and Amos Kendall, Postmaster-General, though he subsequently made several changes. His Secretary of War was Joel R. Poinsett. The chief financial measure of Van Buren's administration was the establishment of the sub-treasury system, by which the public moneys were to be kept in Government offices until required for current expenses, instead of being kept in banks, State or national. This scheme was proposed in Mr. Van Buren's first annual message (1837), but not adopted till 1840, to be repealed the next year, when the Whigs came into power. A serious difficulty, threatening the peace of the U. S., arose from the acts of certain sympathizers with the insurrection which took place in Canada in 1837. A steamer (the Caroline) in this interest was destroyed in U. S. waters by a detachment of British troops, and the act avowed by the British Government as done in self-defense. Three years later a Canadian sheriff was arrested in New York on the charge of murdering a U. S. citizen who had perished on the Caroline, and tried by the State authorities against

the protest and threats of the British Government, which demanded his release on the ground that the act was done under its authority. Fortunately, the prisoner was acquitted on the evidence.

The long-continued financial and industrial distress of Van Buren's administration had lost the Democratic party, for the time, its hold on the country, and Gen. William Henry Harrison, of Ohio, with John Tyler, of Virginia, as Vice-President, was chosen in 1840 by 234 electoral votes, against 60 for Van Buren. At this time a "Liberty party" was formed in the anti-slavery interest, which polled about 7,000 of the nearly 2,500,000 votes cast. From the inauguration of the Government under the Constitution, the scheme of nominating candidates for the presidency and vice-presidency had been by a CAUCUS (*q. v.*) of the members of Congress of each party, but this had become discredited when the Republican party in 1824 repudiated the nomination of Crawford. By 1840 the scheme of national conventions, consisting of delegates chosen by the votes of the party throughout the U. S., had been fully established, and has continued the accepted method of nomination ever since. See NOMINATING CONVENTIONS.

The Whig party, having come into power on the issue of opposition to the sub-treasury and a demand for protection to American manufactures, repealed the sub-treasury —or, more properly, the independent treasury—act in 1841, and in 1842 enacted a tariff by which the existing duties were largely increased. But in other respects that party was doomed to disappointment. Gen. Harrison had scarcely constituted his cabinet when, within one month of his inauguration, he died. Tyler, who succeeded to the presidency, had never been a Whig, but had been selected by the Whigs for his antagonism to Van Buren, the leader of the Northern and more moderate wing of the Democratic party. His veto of a bill chartering a new national bank led to an open quarrel with the party which elected him, and to the resignation of the entire cabinet except Daniel Webster, Secretary of State. For his course in remaining in office Webster was severely blamed, but he was able afterward to point for his ample justification to the so-called Webster-Ashburton treaty, which he was then negotiating with England. By this treaty the claims of the U. S. in several important particulars were fully conceded, and every question in dispute between the two nations, excepting that relating to Oregon, was finally adjusted. For this much was due to Webster, much also to the logic of events. The thirteen States had become twenty-six (Arkansas having been admitted in 1836, Michigan in 1837, the first since Missouri in 1821), the four millions of people had become eighteen.

Texas and the Mexican War.—A motive was now found sufficient to restore the Democratic party to power. Texas had been largely colonized between 1821 and 1835 from the Southern States. In the latter year it revolted from Mexico, and the next year asserted independence, with the unquestioned purpose of ultimately joining the U. S. Independence in fact was soon achieved under the leadership of Houston, and Texas in 1837 offered herself for admission to the Union. The accession was desired by the Southern States, both on account of kinship and for the opportunity that would thus be afforded for extending slave-labor over new soil. The national instinct of territorial aggrandizement came to re-enforce these motives, especially in view of the probability that Great Britain or France might seek to become the protector of the republic. Throughout the administration of Van Buren the movement acquired but little headway. President Tyler, a man of strong Southern feelings, the only Senator who voted against the Force Bill for compelling the obedience of South Carolina in the nullification contest, warmly approved of annexation, and a treaty to that effect was negotiated by Calhoun in 1844, which was rejected by the Senate. The question thus became the principal issue in the election of that year. The Whigs, having their main strength at the North, opposed the annexation of Texas as being in the interest of slavery, and nominated Henry Clay, of Kentucky. The Democrats threw over Van Buren on account of his opposition to annexation, and nominated James K. Polk, of Tennessee, a strong advocate of that measure. Polk received 170 electoral votes, Clay 105; but before the inauguration of Mr. Polk a resolution for the incorporation of Texas was passed by Congress, signed by President Tyler, Mar. 1, 1845, and notice sent to the government of Texas on the last day of his administration. Florida and Iowa also came in as States about the same time.

President Polk formed his cabinet as follows: James Buchanan, Secretary of State; Robert J. Walker, of the Treasury; William L. Marcy, of War; George Bancroft, of the Navy; Cave Johnson, Postmaster-General; John Y. Mason, Attorney-General. The annexation of Texas involved war, inasmuch as Texas and the U. S. claimed the territory to the Rio Grande, while the Mexican Government insisted that Texas only embraced the territory bounded by the river Nueces. Upon this issue hostilities commenced early in 1846. Congress voted men and money, and Gen. Zachary Taylor, commanding the forces on the Rio Grande, entered Mexico and fought the victorious battles of Palo Alto (May 8) and Resaca de la Palma (May 9), and, after being re-enforced by volunteers under Gens. Worth and Wool, captured Monterey Sept. 23. In February of the next year he was attacked in position at Buena Vista by a large Mexican force under the President, Santa Anna, who was repulsed with great loss, and retreated, leaving Taylor in full possession of the northeastern provinces.

Meanwhile New Mexico had been occupied by the U. S. troops, and an invasion of Chihuahua took place with partial success. At about the same time a band of Americans under Capt. John C. Fremont, of the U. S. army, declared the independence of California at Sonora July 4, 1846, and with the co-operation of a fleet under Com. Sloat, soon superseded by Stockton, succeeded in reducing that province. But the army which was to decide the issue of the war was gathering for a movement up the valley of Mexico. In Mar., 1847, Vera Cruz, long deemed impregnable, was reduced after three days' bombardment; and Gen. Winfield Scott, with about 10,000 troops, mainly regulars, commanded by Gens. Worth (who had been detached from Taylor's army), Pillow, Quitman, and Twiggs, moved on Cerro Gordo, where Santa Anna was posted with a superior force. This position was carried Apr. 18 and 19, but Gen. Scott awaited re-enforcements, having lost many men by the termination of their enlistments. In August he entered the valley of Mexico, which Santa Anna defended with 35,000 men. Sanguinary battles followed: Contreras, Aug. 19, 20; Churubusco, Aug. 20; Molino del Rey, Sept. 8; Chapultepec, Sept. 12, 13; and on Sept. 14 Gen. Scott, with 6,500 men, all that remained of the invading column, entered the city of Mexico. The capture of the Mexican capital practically concluded the war; and by the treaty of Guadalupe Hidálgo, Feb. 2, 1848, Mexico ceded the whole of Texas, New Mexico, and Upper California, while the U. S. paid $15,000,000, besides assuming certain claims of its citizens against Mexico on account of long-continued depredations in the Gulf, which had been the subject of negotiations since 1837, to the amount of more than $3,000,000. The U. S. subsequently (1850) paid Texas $10,000,000 on account of her claims to territory not included within the limits of the State.

While war was waging with Mexico a rupture was threatened with Great Britain, on account of the conflicting claims to Oregon. The U. S. claimed as far N. as 54° 40′; Great Britain claimed the mouth of the Columbia. The territory in question had long been in joint occupation, but all attempts at compromise had failed. At the election of 1844 one of the watchwords of the Democratic party had been "Fifty-four Forty, or Fight!" and President Polk gave formal notice that the U. S. receded from the arrangements for joint occupation that had subsisted. At this serious juncture Great Britain offered terms which were accepted, by which the 49th parallel became the boundary-line of the U. S. on the N. W., while Vancouver's island was relinquished to Great Britain. The failure in the treaty to define the status of the smaller island of San Juan led to further complications, which were not settled till 1871.

The important financial measures of Polk's administration were the permanent re-establishment of the sub-treasury system in 1846, and the tariff of the same year, by which duties were largely reduced. The election of 1848 found a third party in the field. The Liberty party had polled about 7,000 votes in 1840, and over 60,000 in 1844. In Aug., 1848, a convention at Buffalo, comprising the members of the Liberty party, with others, many of them Democrats, and some Whigs, disaffected by the course of the old parties respecting slavery, put forward a declaration of principles, and presented as a candidate for the presidency Martin Van Buren, of New York, with Charles Francis Adams, of Massachusetts, for the vice-presidency. The new party succeeded in polling nearly 300,000 votes, though, as it carried no State, it cast no vote in the electoral college. Its leading principle was opposition to the extension of slavery into

new territory, and to the admission of new slave States out of territory already acquired. In all essentials its political doctrines were those which afterward led to the formation of the new REPUBLICAN PARTY (*q. v.*). Slavery was to be sectional, freedom national—slavery to be local and exceptional, to exist only where protected by the laws of States already members of the Union; freedom was to be the general law of the land. These principles were regarded as embodied in the Wilmot Proviso, a proposition offered in 1846 by DAVID WILMOT (*q. v.*), of Pennsylvania, in prospect of the acquisition of territory from Mexico through the war then waging. The Democrats, who had accomplished the annexation of Texas, and had conducted the Mexican war to its successful termination, nominated Lewis Cass, of Michigan. The Whigs nominated Gen. Zachary Taylor, of Louisiana, for President, and Millard Fillmore, of New York, for Vice-President, on a platform intended to conciliate the anti-slavery sentiment of the country. Taylor was elected by 163 votes against 127 for Cass. His cabinet consisted of John M. Clayton, Secretary of State; William M. Meredith, of the Treasury; George W. Crawford, of War; William B. Preston, of the Navy; Thomas Ewing, of the Interior (that office having just been created); Jacob Collamer, Postmaster-General; Reverdy Johnson, Attorney-General. A little more than a year after his inauguration—viz., on July 9, 1850—Gen. Taylor died; Mr. Fillmore succeeded to the presidency. The cabinet was entirely reconstructed, as follows: Daniel Webster, Secretary of State; Thomas Corwin, of the Treasury; Charles M. Conrad, of War; William A. Graham, of the Navy; A. H. H. Stuart, of the Interior; N. K. Hall, Postmaster-General; J. J. Crittenden, Attorney-General.

The Compromise of 1850.—Congress and the country were already in heated conflict, arising out of the proposed extension of slavery to the new territory acquired by the treaty with Mexico. California had in 1849 formed a constitution prohibiting slavery, and applied for admission as a State. The Southern State Rights party, led by Calhoun, demanded the rejection of California, as well as a guaranty, through an amendment to the Constitution, against the further proscription of slavery. New Mexico also appeared as an applicant for admission, while Texas made extensive claims upon the territory of New Mexico. In 1850 Henry Clay again appeared as a pacificator, proposing and carrying the Compromise measures of that year, by which, on the one hand, California was admitted without slavery and the slave-trade was prohibited within the District of Columbia, and, on the other hand, extensive concessions were made to Texas, and the rendition of fugitive slaves was sought to be secured by stringent provisions. As to Utah and New Mexico, the issue was for the time avoided by leaving them under territorial governments and remitting the question of slavery to the inhabitants. The series of measures containing these provisions and known as the Compromise of 1850 passed Congress, with the support of Webster, and were approved by Fillmore in September. The most important measures concerning the foreign relations of the U. S. in this administration were (1) the so-called filibustering expedition to wrest Cuba from Spain, which resulted in the capture and execution of many of the adventurers; and (2) the negotiation of a treaty with Japan by Com. Perry, who had entered the waters of that country with a fleet for that purpose.

The Slavery Question.—In the Constitution slavery, which had been introduced into the country as early as 1620, was treated as though it were of transient significance. In many of the Northern States it had already been abolished. In the South, however, owing largely to the invention of the cotton-gin, the raising of cotton by slaves soon became a very profitable industry. What, therefore, Washington and Jefferson regarded as a transient evil, to be eradicated at an early day, came to be strongly intrenched in what were believed to be the financial interests of the people. Instead of diminishing, the number of slaves increased, even after the lawful importation of slaves was discontinued. Meanwhile, in the North, a strong anti-slavery sentiment was developed. Though at first the sympathisers with the agitation were few, the number steadily increased. Anti-slavery papers, started by LUNDY and GARRISON (*qq. v.*), slowly but surely gained adherents. John Quincy Adams led the attack for the exclusion of slavery from the District of Columbia, and PHILLIPS (*q. v.*) aroused public opinion for the abolition of slavery from all parts of the country. Intense excitement and bitterness resulted. The people of the North were not generally in favor of interfering with slavery where it existed, believing that it was a domestic institution, which under the Constitution could be dealt with only by the individual States. But they were intensely opposed to the introduction of slavery into territory where it did not already exist. They insisted, moreover, upon the right of agitation for the purpose of forming and moulding public opinion. The people of the South, on the other hand, insisted that as slavery was a domestic institution, the people of the North had no right to interfere with it, even by the promulgation of anti-slavery opinions. Anti-slavery books and papers, as far as possible, were excluded from the South. The publication of Mrs. Stowe's *Uncle Tom's Cabin*, in 1852 created a profound and almost universal impression in the North. By means of these conflicting opinions the gulf between the North and the South grew wider and wider. WILLIAM H. SEWARD (*q. v.*) in 1858 spoke of the subject as an "irrepressible conflict." The intensity of the strain was increased by the fact that many in the North refused to assist in the return of fugitive slaves. Some even assisted in the escape of slaves to Canada, where they could not be arrested and returned.

The election of 1852 found both the great political parties insisting on the Compromise of 1850 as "a finality." Many of the dissatisfied Democrats who had voted for Van Buren in 1848 had gone back to their party, and the popular vote of the Free-soil or Liberty party of 1852 was little more than half of that of the election previous. Gen. Scott, who had been nominated by the Whigs, was defeated, receiving but 42 electoral votes, all from four States, against 254 votes for Franklin Pierce, who, with William R. King, of Alabama, for Vice-President, had been nominated by the Democrats. President Pierce's cabinet consisted of William L. Marcy, Secretary of State; James Guthrie, of the Treasury; Jefferson Davis, of War; James C. Dobbin, of the Navy; Robert McClelland, of the Interior; James Campbell, Postmaster-General; Caleb Cushing, Attorney-General. In 1853 the U. S. acquired, by purchase from Mexico, the tract S. of the river Gila in Arizona and New Mexico, containing 45,535 sq. miles, known as the Gadsden purchase.

Early in 1854 Stephen A. Douglas, of Illinois, the most conspicuous of the younger leaders of the Democratic party, introduced into the Senate a bill for the organization of territorial governments in Kansas and Nebraska, preparatory to their admission as States. By the Missouri Compromise of 1820 slavery was to be forever excluded from that region, but the Kansas-Nebraska bill repealed this provision, leaving the question to be determined by the inhabitants themselves, under the principle advocated by Douglas, known as "squatter sovereignty." This most unwise and disastrous effort to open the burning question once more by making it possible for slavery to be introduced into Territories N. of the Compromise line, encountered earnest resistance from the Whigs and the few Free-soilers in Congress, and aroused intense indignation in many portions of the North. The bill was, however, firmly pressed, and became a law in May.

The Kansas War.—A contest at once began for the colonization of Kansas, the more southerly of the two Territories, active efforts being made in the free States to induce migration hostile to slavery, while the opposing party sought to secure Kansas both through immigration and through periodical raids from the border counties of Missouri. Violence was freely resorted to, and many undoubted wrongs were perpetrated by both parties. This struggle, which at times amounted to civil war, continued through the presidency of Pierce, and was bequeathed to his successor. The anti-slavery sentiment of the North was still further inflamed by a conference between the U. S. ministers to France, Spain, and Great Britain, which resulted in their issuing a circular known as the Ostend Manifesto, favoring the acquisition of Cuba in the interest of slavery, and by a violent assault made in 1856 by Preston S. Brooks, of South Carolina, for words spoken in debate, upon Senator Charles Sumner (see SUMNER, CHARLES), of Massachusetts, who with Chase, of Ohio (see CHASE, SALMON P.), and Seward, of New York, had led the opposition to the repeal of the Missouri Compromise. The Free-soil party of 1848 and 1852 now passed into the Republican party, which for the election of 1856 nominated John C. Frémont on a declaration of opposition to the extension of slavery into the Territories. So strong had become the sense of the inadequacy of the Whig party to offer resistance to the encroachments of the slavery propagandists that the popular vote for Frémont rose above 1,300,000. This, while nearly 500,000 short of the vote for Buchanan, the Democratic candidate, was yet 500,000 in excess of the

vote for Fillmore, the former President, who had been nominated by the Whigs. In the electoral college Buchanan received 174 votes, Frémont 114, Fillmore 8. This passage of the Whigs into the Republican party was assisted by a violent popular agitation in 1854 against the political influence of foreigners who had been naturalized as citizens of the U. S. These generally voted with the Democratic party. This agitation against foreign influence led to the formation of a secret political society known as the Native American order, more popularly as the KNOWNOTHINGS (*q. v.*), which in 1854 carried several States and elected many members of Congress, but in 1856 fell away in the presence of the more exciting issue of slavery. On the last day of Pierce's administration (Mar. 3, 1857), a tariff bill passed Congress which greatly reduced the customs duties of 1846. Buchanan, who as U. S. minister to Great Britain had taken part in the Ostend conference, constituted his cabinet of Lewis Cass, Secretary of State; Howell Cobb, of the Treasury; John B. Floyd, of War; Isaac Toucey, of the Navy; Jacob Thompson, of the Interior; Aaron V. Brown, Postmaster-General; and Jeremiah S. Black, Attorney-General.

The troubles in Kansas still continued to agitate the entire country. In the struggle between the Free-State and the Slave-State parties the power of the administration was thrown in favor of the latter, and that party in Congress, in spite of the opposition of a minority of its members headed by Stephen A. Douglas, carried through a bill submitting to the people of Kansas for ratification the so-called Lecompton constitution, which had been framed by the pro-slavery party, constituting an unmistakable minority of the State. Meanwhile several of the Northern States passed acts intended to assert the personal liberty of their citizens against certain of the provisions of the Fugitive-slave laws, which were deemed unconstitutional, by securing a jury trial and the privilege of *habeas corpus* in the cases of alleged fugitives from service. On the other hand, the Supreme Court, of which Roger B. Taney, once Gen. Jackson's Attorney-General and Secretary of the Treasury, was chief justice, decided in the Dred Scott case in favor of the claim of the extreme Southern State Rights partisans, that the slaveholder should be allowed to carry his property with him anywhere under the protection of the Constitution. The question of slavery had now become the one question of national politics, and it was evident that, as the Whig party had been rent by the antagonisms developed by this issue, the Democratic party was to be likewise disrupted in the efforts of the Southern leaders to assert the nationality of slavery. The leader of the more conservative Democrats was Senator Douglas, by whose act in 1854 the question of slavery in the Territories had been reopened after the settlement of 1820. The approaching conflict of arms was intimated toward the close of Buchanan's administration by the attempt of JOHN BROWN (*q. v.*), formerly a leader of the Free-State party in the Kansas struggles, to seize the U. S. armory at Harper's Ferry, Va., for the carrying out of plans he had formed for the wholesale escape of the slaves of that region. After a brief success and a fierce resistance, Brown and his party were overcome by a detachment of U. S. troops, and were given up to the State authorities for trial and execution.

The disruption of the Democratic party, in consequence of the manner in which the issue of the nationality of slavery was pressed by the Southern wing, occurred at the national convention held at Charleston in Apr., 1860, for the nomination of Buchanan's successor, when the majority of the Southern delegates withdrew upon the passage of a resolution declaring that the constitutional status of slavery should be determined by the Supreme Court. In consequence of the secession, the convention was adjourned till June, when Douglas was nominated. The seceding delegates met later in convention and nominated John C. Breckenridge, of Kentucky, who had been Vice-President with Buchanan. A convention representing what was called the Constitutional Union party, embracing many former Whigs, with what was left of the Native American party, nominated John Bell, of Tennessee, with Edward Everett, of Massachusetts, for Vice-President. The Republican national convention nominated Abraham Lincoln, of Illinois, with Hannibal Hamlin, of Maine, for Vice-President, on a declaration of principles which, while leaving "inviolate the rights of the States, and especially the right of each State to order and control its own domestic institutions," made freedom "the normal condition of all the territory of the U. S." Douglas received 12 votes from Missouri and New Jersey; Bell received 39 votes from Virginia, Kentucky, and Tennessee; Breckenridge received all the Southern votes remaining, 72 in number; Lincoln received all the Northern votes remaining, 180 in number, and was elected.

Among other events and measures of Buchanan's administration must be noted the expedition under Col. Albert S. Johnston against the Mormons in Utah, to assert the authority of the Government, which had been defied by Brigham Young; the admission of Minnesota as a State in 1858, and of Oregon in 1859; but particularly the commercial and financial crisis of 1857, which began in September with the failure of a large trust company in New York, producing a panic which spread rapidly, until in two or three weeks' time the banks had generally suspended and numerous failures, mainly commercial, had occurred. The recovery from the effects of this disaster was, however, very prompt, and no long suspension of industry resulted.

The Civil War.—The canvass preceding the election of LINCOLN (*q. v.*) had been highly exciting.. Extensive preparations for conflict followed at the South, with a general arming and drilling of the population. The Southern leaders declared the election of a President pledged to oppose the extension of slavery to be a moral invasion of the slave States, and a violation of their constitutional rights. South Carolina led in secession in Dec., 1860; other slave States followed, and in February, 1861, their delegates met in convention at Montgomery, Ala., and framed a constitution for "the Confederate States of America." Jefferson Davis, of Mississippi, was chosen President, Alexander H. Stephens, of Georgia, Vice-President. Apr. 12 the troops of South Carolina opened fire on the U. S. garrison of Fort Sumter in Charleston harbor, which two days later surrendered. The news of actual conflict overcame alike the scruples of the Democrats at the North and of the Unionists at the South, and each section went into the war practically entire. Eleven States, with an aggregate population of 9,000,000, were arrayed against the Government. Kentucky, Maryland, and Delaware remained in the Union, though the first two furnished many soldiers to the Confederate armies.

Lincoln had been inaugurated on Mar. 4. His cabinet was constituted as follows: William H. Seward, Secretary of State; Salmon P. Chase, of the Treasury; Simon Cameron, of War; Gideon Welles, of the Navy; Caleb B. Smith, of the Interior; Montgomery Blair, Postmaster-General; Edward Bates, Attorney-General.

The day following the surrender of Sumter the President issued a call for 75,000 militia, which were put under arms in a surprisingly short time. The strong sympathy with secession in Baltimore led to an attack by a mob upon the Sixth Massachusetts Regiment, on the way to Washington, Apr. 19, in which several soldiers were killed. A military occupation of the city soon suppressed the rebellious sentiment, and the arriving militia took position along the Potomac in defense of Washington, already menaced by the Confederates. For an account of this and the other events of the civil war, see CONFEDERATE STATES.

The conduct of the civil war (1861–65) had been much embarrassed by fears of interference on the part of France and Great Britain. Such action was rendered more probable on the part of the latter power from the irritation caused by the seizure of Mason and Slidell, Confederate envoys to England and France, who were taken off the British vessel Trent by Capt. Wilkes, of the U. S. steamer San Jacinto, in Nov., 1861. War was averted by the release of the envoys on the demand of Great Britain. The occupation of Mexico by the European powers and the attempt to establish an empire by the aid of French troops (see MAXIMILIAN) were also regarded by the U. S. Government as a menace.

Perhaps in no war has the conduct of affairs been more affected by political exigencies. In 1862 and 1863 elections in several States went against the administration, and the necessity of resorting to a draft in the summer of 1863 led to riots in New York, which involved much loss of life and property, and required for their suppression considerable detachments from the army. (See DRAFT RIOTS.) The measures which were especially obnoxious were the suspension of the Habeas Corpus Act, the abolition of slavery in the District of Columbia and in the Territories, the enlistment of colored soldiers, and the proclamation of the President (Jan. 1, 1863), declaring free all persons held as slaves in all States and parts of States in rebellion.

In 1864 the Democrats nominated for the presidency Gen. George B. McClellan on a platform denouncing the arbitrary measures of the executive and declaring the war a

failure. Lincoln was renominated by the Republican party, and elected, with Andrew Johnson, of Tennessee, as Vice-President, by 212 votes against 21 for McClellan. On Apr. 14, 1865, a little more than a month after his reinauguration, President Lincoln was assassinated at Washington by J. Wilkes Booth. Booth was killed by his pursuers, and four of his accomplices were executed on the sentence of the military court. Vice-President Johnson succeeded to the presidency.

No one was criminally punished for participation in the war of secession. Jefferson Davis, President of the Confederacy, after the fall of Richmond, escaped southward, was captured in Georgia, placed on trial, and released on bail. Several successive amnesty proclamations of increasing scope were issued between May, 1865, and Dec., 1868, the last being universal. By proclamation of the President of the U. S. the civil war was declared at an end on Apr. 2, 1866.

The financial legislation of the war covered the issue, in 1862 and subsequently, of notes of the U. S., constituting a legal tender; the issue of interest-bearing bonds of several different descriptions; the establishment of the national banking system; the increase of customs duties from the low average under the tariff of 1857 to an average of nearly 50 per cent.; the imposition of a great variety of excise duties and a direct tax. (See the titles BANK, CURRENCY, and TARIFFS.) The ordinary expenditures of the Government which had to be thus provided for rose from $60,000,000 in 1860 to $1,217,000,000 in 1865.

Reconstruction.—The work of political reconstruction constitutes the great feature of the history of the U. S. from 1865 till the withdrawal of Federal troops from the Southern States in 1877. In 1863 fifty counties of Virginia W. of the Alleghanies were admitted to the Union as the State of West Virginia, being the thirty-fifth State, the required formal assent of Virginia thereto being given by a legislature gathered from a few counties adjacent to Washington. In Dec., 1863, a proclamation of the President provided for the re-establishment of civil government in any seceded State on the initiative of a number of qualified voters, not less than one-tenth of the number voting at the presidential election of 1860. Under this scheme governments were instituted in 1864 in Louisiana and Arkansas. In 1865 the 13th Amendment to the Constitution, abolishing slavery within the U. S. and all places subject to their jurisdiction, was ratified by three-fourths of the States, and was proclaimed by the Secretary of State Dec. 18. In 1865 provisional governors were appointed by the President in most of the Southern States, the regular army of the U. S. still remaining in occupation of the territory, though the volunteers had been disbanded. By these provisional governors conventions were to be called to place the several States in a position to resume their interrupted federal relations, the principal conditions being the repeal of the ordinances of secession, the repudiation of public debts incurred in aid of the Confederacy, and the abolition of slavery by the authority and as the act of the States themselves. Such conventions were held and ordinances passed, but the action was not satisfactory to the Republican party in Congress, with which President Johnson soon broke even more completely than President Tyler had broken with the Whig party in 1842. It was alleged by the Republican leaders that the Southern whites were seeking by stringent laws of apprenticeship and vagabondage to reduce the late slaves to a condition of virtual slavery. Congress therefore refused to admit the Senators and Representatives of the reorganized governments, and in April, by a two-thirds vote, passed over the President's veto, the Civil Rights Bill, intended to protect the freedmen, and enlarging the jurisdiction of the U. S. courts to this end. In June, 1865, the two houses of Congress proposed the 14th Amendment to the Constitution, which was subsequently ratified by the requisite number of States, and proclaimed July 28, 1868. This provides in its first section that all persons born or naturalized in the U. S., and subject to the jurisdiction thereof, shall be deemed to be citizens of the U. S. and of the State where they reside, and that no State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the U. S.; nor shall any State deprive any person of life, liberty, or property without due process of law, nor deny to any person within its jurisdiction the equal protection of the law; and Congress is authorized to enforce these provisions by appropriate legislation. The second section of the amendment sought to induce the States to confer the right of suffrage on the blacks by providing that otherwise the representation of any State should be diminished in the proportion which the excluded classes bore to the total population; but, inasmuch as a subsequent amendment conferred the right of suffrage without distinction of color and without reference to the choice of the States, this section of the 14th Amendment remains wholly without content. The third section prohibits certain classes of persons, participants in the rebellion, from holding office under the U. S. or any of them until such disability shall have been removed by a two-thirds vote of both houses of Congress. The fourth section provides that the validity of the public debt of the U. S. shall not be questioned, and that the U. S. or any of them shall never assume or pay any debt incurred in insurrection, or any claims for the loss or emancipation of any slave.

The antagonism between the President and the Republican majority in Congress gradually increased, until Congress, in Mar., 1867, passed over the veto the Tenure of Office Act, to limit the President's power of removal from office. In Feb., 1868, the President, in defiance of this law—which he deemed an unconstitutional invasion of the executive functions—designated Gen. Lorenzo Thomas, adjutant-general of the army, as Secretary of War *ad interim*, removing STANTON (*q. v.*) from the office. This led immediately to an impeachment of the President by the House of Representatives, which was tried by the Senate, the chief justice presiding. President Johnson was acquitted, the prosecution failing to secure a two-thirds vote for conviction. Secretary Stanton, resigning, was succeeded by Gen. John M. Schofield, and Attorney-General Stanbery, a little later, was succeeded by William M. Evarts, who had been of the President's counsel.

The presidential election approaching, Johnson failed of renomination by either party, the Democrats putting forward Horatio Seymour, formerly Governor of New York, the Republicans nominating Gen. U. S. Grant, with Schuyler Colfax, of Indiana, Speaker of the House of Representatives, for Vice-President. Grant and Colfax were elected, receiving 214 votes against 80 for their opponents; three States, Virginia, Texas, and Mississippi, were not admitted to the electoral college.

The accessions to the U. S. during Johnson's administration had been through the admission of Nebraska as the thirty-seventh State in 1867, Nevada having been admitted as the thirty-sixth State in 1866, and the purchase of Alaska from Russia for the sum of $7,000,000. In Feb., 1869, just before the expiration of Johnson's term of office, the 15th Amendment to the Constitution was passed by Congress over the veto. This amendment provides that the rights of citizens of the U. S. to vote shall not be denied or abridged by the U. S., or by any State, on account of race, color, or previous condition of servitude. It received the ratification of the requisite number of States, and was proclaimed Mar. 30, 1870.

In President Grant's administration the office of the Attorney-General was enlarged to constitute the administrative department of justice, having supervision of U. S. district attorneys and marshals. All the States were restored to representation in Congress. Between 1869 and 1873 the tariff duties imposed during the war suffered considerable reductions, while the internal revenue duties were mainly abolished, except as to spirits and tobacco. The reform of the civil service was begun in this administration; but Congress failed to furnish the requisite means for carrying it on, and no great progress was made. The completion of the Union Pacific and Central Pacific railways, making a continuous line from the Missouri to the Pacific, was effected in 1869. Out of the connection of the Government with these roads arose much scandal from the alleged corruption of certain members of Congress, who were charged with receiving stock of the Credit Mobilier Company, which built the road. The charges were investigated by Congress in winter of 1872–73, with much injury to the reputation of several members.

During the presidential election of 1868, which was the first national election after the 15th Amendment to the Constitution, numerous outrages were perpetrated upon the colored people of several of the Southern States, and intimidation was largely exercised to restrain their political action. These acts were generally committed by masked men, supposed to belong to a widespread organization to which was popularly given the name KU-KLUX KLAN (*q. v.*) In Apr., 1871, an act was framed under the authority of the

14th Amendment to the Constitution, enlarging the jurisdiction of the U. S. courts for the punishment of such offenses.

In 1871 a treaty was negotiated at Washington between commissioners on the part of the U. S. and of Great Britain for the settlement of the Alabama and other claims against Great Britain arising out of the depredations of the Confederate cruisers built in England, and also for the adjustment of the conflicting claims of the two countries to the islands of the San Juan group between Vancouver's island and the continent on the Northwest. The latter were referred to the Emperor of Germany as arbitrator, who decided in favor of the U. S. The Alabama and kindred claims were referred to a tribunal to be convened at Geneva, consisting of five arbitrators, appointed, one each, by the President of the U. S., the Queen of England, the King of Italy, the President of the Swiss Confederation, and the Emperor of Brazil. The arbitrator on the part of the U. S. was Charles Francis Adams, who had been minister to Great Britain during the war. The tribunal assembled in Dec., 1871, and, after hearing the evidence and the arguments, awarded to the U. S. a gross sum of $15,500,000, to be distributed by the Government. By the same treaty certain other claims, both of American citizens against the British Government and of British citizens against the Government of the U. S., were referred to a joint commission of three. The commissioner on the part of the U. S. was James S. Frazer. The commission met at Washington in Sept., 1871, and sat nearly two years, making a net award against the U. S. of about $2,000,000. Another commission, provided for by the treaty for determining the disputed rights of navigation and fishing between Canada and the U. S., met at Halifax in 1877, and awarded $5,500,000 to Great Britain.

The unsettled condition of affairs in Santo Domingo in 1869–71 led to propositions for its acquisition by the U. S., and the President appointed a commission to visit that territory and report respecting the state of society therein; which they did, but with no practical result.

As the presidential election of 1872 approached, considerable dissatisfaction was developed among a section of the Republican party in consequence of many alleged abuses of the public patronage, especially the manner in which the power of the administration had been used to sustain Republican ascendency through Negro votes in the Southern States. In May a convention of Liberal Republicans met at Cincinnati and nominated Horace Greeley, of New York, for President. This nomination was ratified by the Democratic convention, though a very small section of the party repudiated the action and nominated Charles O'Conor, of New York. The Republicans in convention at Philadelphia renominated President Grant, with Henry Wilson, of Massachusetts, for Vice-President. The Republican ticket received the electoral vote of twenty-nine States—in all, 286 votes. The votes of Arkansas and Louisiana were thrown out for irregularities. The remaining six States, all late slave States, went Democratic, but Greeley having died before the assembling of the electoral college, this vote was scattered according to local preferences.

In Oct., 1873, the steamer Virginius, carrying the U. S. flag, and having on board munitions of war and recruits for the insurgents in Cuba, was captured by a Spanish armed vessel, and a number of the prisoners shot by the authorities in Cuba. War was anticipated, and considerable naval preparations were made by the U. S., but the lawless character of the Virginius was fully established, and friendly relations were restored, Spain paying a sum for the relief of the families of the victims.

In the same year there was a commercial crisis resulting in frequent and disastrous failures in business, owing to the unsatisfactory condition of the currency and the prevalent spirit of speculation. At the outbreak of the war a paper currency was issued in such quantity that at the close of the struggle the "greenback" dollar was greatly depreciated. Prices rose enormously and the spirit of speculation became general. It was the era of railway building. Enormous fortunes were made, and these enticed people into unsafe ventures. The commercial crisis that followed was laid at the door of the administration, and consequently the congressional elections of 1874 turned a Republican majority of sixty or seventy in the House of Representatives into a nearly equal Democratic majority. After the panic of 1873 both houses of Congress passed a bill for the further inflation of the currency, but this bill was vetoed by the President. Just before the incoming of the new House of Representatives, Congress passed an act declaring that specie payments, which had been suspended early in the civil war, should be resumed by the U. S. on Jan. 1, 1879.

In the autumn of 1875 the elections in the States of Ohio and Pennsylvania were severely contested between the Democrats and the Republicans on the currency issue, popularly known as "hard money" or "soft money," the position taken by the former party being that the Resumption Act of 1875 was arbitrary, ineffective, and injurious to the industry of the country. Both these elections were carried by the Republicans. The Democrats coming into power in the House of Representatives for the first time in sixteen years, many investigations were made by special and standing committees into the conduct of affairs by the Republicans, and reports were made censuring the conduct of various cabinet officers and subordinate officials. On the report of a committee to examine the expenditures of the War Department, William W. Belknap was impeached as Secretary of War for corruption in the appointment of a post-tradership. The impeachment was tried by the Senate, and Mr. Belknap, who had resigned from office before the vote of impeachment, was acquitted, less than two-thirds voting for conviction.

In May, 1876, an international exhibition was opened at Philadelphia under the auspices of the U. S. Government, which made an appropriation of $1,500,000 for the purpose, while the private, municipal, and State subscriptions aggregated several times that amount.

One of the features of President Grant's administration was the appointment of Indian agents upon the recommendation of the religious societies and missionary boards having the spiritual charge of the tribes. This did not, however, prevent three Indian wars. The first occurred with the Apaches in Arizona, who, after numerous depredations and massacres, were severely punished by Gen. Crook. A second with the Modocs, a small band under "Captain Jack," ranging in Southern Oregon and Northern California, began in 1873 with the massacre of Gen. Edward R. S. Canby while treating with the savages, and was closed by the utter destruction of the band after severe losses to the U. S. troops, from the difficult character of the lava-beds in which Captain Jack made his stand. The third began in 1876 with a large body of Sioux Indians under Sitting Bull in Montana, who refused to receive the terms of the Government and remain at the agencies established for them. In June Gen. George A. Custer moved against the hostile Sioux with a regiment of cavalry, and, dividing his command, advanced with five companies into the neighborhood of a camp of more than 2,000 warriors. Custer and his troops were surrounded and every man fell, no one remaining alive to tell the tale. The other companies of Custer's command were attacked by the Indians, but were saved by the arrival of Gen. Terry with a large body of infantry. Extensive preparations were at once made by the Government for punishing this band, and a formidable expedition under Gens. Crook and Terry was sent against them, but without important result.

On the approach of the presidential election of 1876 the Republican party in convention at Cincinnati nominated for President Rutherford B. Hayes, Governor of Ohio, with William A. Wheeler, of New York, for Vice-President. The Democratic convention nominated for President Samuel J. Tilden, Governor of New York, with Thomas A. Hendricks, Governor of Indiana, for Vice-President, on a platform demanding the repeal of the Resumption Act of 1875. The election that followed resulted in one of the greatest strains to which the Constitution was ever subjected. From South Carolina, Florida, Louisiana, and Oregon two sets of returns were sent in. In each of these States one set of the votes was entirely Republican, while the other set was entirely Democratic, except in Oregon, where two votes were Republican and one Democratic. If all these States should cast their entire vote for the Republican ticket Hayes would have 185 votes and Tilden 184. If even the odd Democratic vote of Oregon should be cast for Tilden he would have 185 votes and would be elected. The Senate was Republican and the House was Democratic, and therefore Congress could not agree on a method of counting the votes. It was finally decided that the disputed points should be submitted to a commission of five Senators, five Representatives, and five members of the Supreme Court. The commission had eight Republicans and seven Democrats. Every question was decided by a strict party vote, and consequently Hayes received 185 votes and was declared elected. The decision

Longitude
West
DOMINION OF
Lake Winnipegosis
Lake Winnipeg
Lake Manitoba
BOUNDARY 1848
BOUNDARY DETERMINED 1818
VANCOUVER ISLAND
Cape Flattery
Seattle
WASHINGTON
OLYMPIA
OREGON
Portland
Columbia R.
SALEM
IDAHO
MONTANA
HELENA
Missouri R.
Yellowstone R.
NORTH DAKOTA
BISMARCK
Fargo
Red R. of the North
MINNESOTA
Minneapolis
SOUTH DAKOTA
PIERRE
Sioux Falls
YELLOWSTONE NATIONAL PARK
LOUISIANA
ACQUIRED BY
DISCOVERY 1792
EXPLORATION 1805
SETTLEMENT 1811
TREATY 1819
BOUNDARY AS DETERMINED
WYOMING
North Platte R.
NEBRASKA
Omaha
DES MOINES
LINCOLN
Platte R.
Missouri
C. Mendocino
Great Salt Lake
SALT LAKE CITY
CHEYENNE
Sacramento R.
SACRAMENTO
CARSON CITY
NEVADA
UTAH
Green R.
Grand R.
DENVER
South Platte R.
PURCHASE
TOPEKA
Kansas City
JEFFERSON
San Francisco
San Joaquin R.
ACQUIRED FROM MEXICO BY CONQUEST AND TREATY 1845-1848
COLORADO
SPANISH
KANSAS
Arkansas R.
TREATY OF
OKLAHOMA
INDIAN TER.
GUTHRIE
Pt. Conception
Los Angeles
ARIZONA
Colorado R.
SANTA FE
Albuquerque
NEW MEXICO
CEDED BY TEXAS 1850
Red R.
Ft. Worth
San Diego
PHOENIX
Gila
BOUGHT OF MEXICO 1853
GADSDEN PURCHASE
Colorado R.
TEXAS
ANNEXED IN 1845
AUSTIN
Rio Grande
PACIFIC OCEAN
MEXICO
ALASKA
SCALE OF MILES
Pt. Barrow
Arctic Ocean
PURCHASED FROM RUSSIA 1867
East Cape
Bering Str.
C. Prince of Wales
ARCTIC CIRCLE
Yukon River
BRITISH NORTH AMERICA
ST. LAWRENCE I.
Dawson City
NUNIVAK I.
BERING SEA
Skaguay
Sitka
ALASKA PEN.
KADIAK I.
NORTH PACIFIC OCEAN
ALEUTIAN ISLANDS
PRINCE OF WALES I.
QUEEN CHARLOTTE IS.
HAWAIIAN or SANDWICH IS. and WAKE ISLAND
SCALE OF MILES
PEARL & HERMES REEF
TROPIC OF CANCER
WAKE I.
NIIHAU
Honolulu
HAWAII
ACQUIRED BY TREATY 1898
PACIFIC OCEAN

Map showing
LAND ACQUIRED BY THE
UNITED STATES
FROM 1783 TO 1899
SCALE OF MILES
0 50 100 200 300
CEDED BY GREAT BRITAIN 1783
CEDED BY MASSACHUSETTS 1785
CONNECTICUT CESSION 1786 AND 1800
VIRGINIA CESSION 1784
NORTH CAROLINA CESSION 1790
S. CAR. CESSION 1787
CEDED BY GEORGIA 1802
MISSISSIPPI TERRITORY 1798
CLAIMED BY U.S. AND GA.
CEDED BY GA. 1802
LOUISIANA PURCHASE
SPAIN 1819
Boundary claimed by U.S.
Settled by Treaty 1842
Boundary claimed by Great Britain
PHILIPPINE ISLANDS
SCALE OF MILES
ACQUIRED FROM SPAIN BY CONQUEST AND TREATY 1899
PART OF WEST INDIES
SCALE OF MILES
ACQUIRED FROM SPAIN BY CONQUEST AND TREATY 1899
GUAM ISLAND
Part of LADRONE IS.
SCALE OF MILES
ACQUIRED FROM SPAIN BY CONQUEST AND TREATY 1899
TUTUILA ISLAND
Part of SAMOA ISLANDS
SCALE OF MILES
ACQUIRED BY TREATY 1899

was not announced until Mar. 2, two days before the inauguration. See PRESIDENTIAL ELECTORAL COMMISSION.

The administration of President Hayes was free from the scandals that had but recently prevailed. One of his first acts was to withdraw the Federal troops from the South and thus leave the Southern States to govern themselves. The period of reconstruction was closed by this act. In 1873 the Coinage Act had put an end to the free coinage of silver in the U. S. (See SILVER COINAGE IN THE U. S.) In 1878 the Bland Silver Bill, providing for the coinage of silver dollars of 412½ grains in quantities of not less than $2,000,000, and not more than $4,000,000 a month, became a law. In 1879 specie payment was resumed.

Beginnings of Civil Service Reform.—In 1880 James A. Garfield, the Republican candidate, was elected President and Chester A. Arthur Vice-President, Garfield receiving 214 electoral votes as against 155 cast for the Democratic candidate, Gen. Hancock. No sooner was the result of the election known than the clamor for offices broke out with unwonted violence. Congress had given very meager support to the efforts of the Presidents to establish civil service reform (see CIVIL SERVICE AND CIVIL SERVICE REFORM), and the contributors to Garfield's success now claimed their reward. The President refused to comply with the demands of the Senators from New York in regard to the collectorship of the port of New York city, whereupon both Senators tendered their resignations to the New York Legislature. On July 2 the President was shot in a railway station in Washington by a man named Guiteau, who had failed to obtain a small office. After more than ten weeks of painful lingering the President died Sept. 19, and was succeeded by Vice-President Arthur. The horror of this great crime awakened the people to the evils of the "spoils system," and an act was soon passed for the reform of the civil service. The strength of the reform movement thus set on foot during the administration of President Arthur showed itself in the election of 1884. The candidates were the Republican leader JAMES G. BLAINE and the Democratic Governor of New York GROVER CLEVELAND (*qq. v.*). Many Republicans now identified with the reform movement refused to support Blaine, who received 182 electoral votes, while Cleveland received 219, and was therefore elected. The reform of the civil service continued to be slowly but surely advanced.

Financial Questions.—As the great questions involved in the civil war and the reconstruction of the Southern States were gradually settled, questions of finance assumed increasing importance. The pension laws for the assistance of veterans of the war made large and increasing demands on the treasury. The existing tariff laws were highly unsatisfactory to Cleveland's administration. The Walker tariff of 1846, enacted, for the most part, for revenue only, had continued, with modifications still further reducing the rates in 1857, till the outbreak of the war. The necessity of additional revenue and the advent to power of the Republican party, which had inherited the old Whig doctrines of a tariff for protection as well as revenue, led to the high protective Morrill acts of 1861 and 1862. These acts from time to time were modified, the modifications being often in the interest of higher protection. In 1887 President Cleveland made the question of the tariff the subject of his message to Congress. Advocating an abandonment of the protective policy, he urged the establishment of a revenue tariff which should tend toward the ultimate establishment of free trade. This message brought the tariff question into immediate prominence, and caused it to overshadow all other issues in the next election. The Republicans put forward as their candidate Benjamin Harrison, of Indiana, a grandson of President William Henry Harrison. Cleveland received 168 electoral votes and Harrison 233.

This popular indorsement of the principle of protection led to the enactment of the McKinley tariff of 1890, which largely increased the duty on certain articles and diminished it on others, all the provisions of the act being adjusted for the purpose of further emphasizing the principle of protection to American industries. At about the same time the pension laws were modified so as greatly to increase the demands upon the treasury from this source. In the meanwhile the operation of the Bland silver law had stimulated the development of mines and the production of silver, and this result had emphasized the popular call for a more liberal rate of coinage. The demand was met by the Sherman act, which provided for large monthly purchases of silver bullion. An attempt to pass what was commonly called the Force Bill, providing for Federal supervision of elections, intensified political feeling. There were also unmistakable signs of financial uneasiness. The very rapid accumulation of silver in the treasury caused by the Bland and the Sherman acts awakened a financial distrust which was followed by a large balance of trade against the country, and the consequent embarrassment of large exports of gold. These several untoward facts contributed to the result of the election in 1892. Harrison and Cleveland were both renominated; Cleveland received 277 electoral votes, Harrison 145. The so-called People's Party cast 22 electoral votes. The House of Representatives became overwhelmingly Democratic, and the victorious party also obtained a slight majority in the Senate. Thus for the first time since the civil war the Democrats were placed in control of both the elective branches of the Government. During President Harrison's term, six new States—the two Dakotas, Wyoming, Montana, Idaho, and Washington—had been admitted to the Union. The census of 1890 showed that the Northwest had enormously increased in population and wealth during the preceding ten years. That the influence of this region had grown in corresponding measure was shown by the fact that, after a very warm contest between different cities for the World's Columbian Exposition of 1893, Congress decided that it should be held at Chicago.

The first important act of Cleveland's second administration was to call an extra session of Congress for the purpose of dealing with the financial situation. The exports of gold and the accumulations of silver were so great that the President earnestly recommended the repeal of the silver clause in the Sherman act. Congress adopted this recommendation, though only after a long discussion which disclosed a formidable faction or party that advocated the free coinage of silver. The repeal, however, did not avert the impending crisis. In view of an anticipated radical change in the tariff, the manufactures of the country fell into deep depression, and the rapid fall in the price of silver caused a very general wreck of industries in the mining States. The crash resulted in the suspension of many banks and the failure of many business houses. The Wilson Tariff Act, adopted in 1894, was far less radical as a measure for revenue only than the one the leaders of the party had advocated, for the reason that a few Democratic members of the Senate could not be brought to co-operate with their party colleagues. The act was a source of bitter disappointment to a majority of the people in many ways. It fell short of what the advocates of tariff reform desired, and it provided for a tax upon persons having incomes of more than $4,000 a year. The opposition aroused by these two features of the measure and the continued financial depression led to overwhelming Republican victories throughout the country in Nov., 1894. The Senate was given a small Republican majority, while in the House of Representatives the victorious party had more than twice as many members as their opponents. On May 21, 1895, the Supreme Court, by a majority of five judges against four, declared those portions of the Wilson act which established an income tax invalid, on the ground that they provided for what is practically a "direct tax," in a manner not authorized by the Constitution. This decision by a majority of one in a court of nine judges is a most interesting and significant example of the authority of this branch of the Federal Government.

The presidential campaign of 1896 was characterized by great political tension, a remarkable sundering of party ties, and much anxiety in regard to its outcome, owing to the importance of the issues involved. The agitation in favor of the free coinage of silver at a ratio of 16 to 1 had become very aggressive, and at the national conventions overshadowed almost all other issues. The Republican convention, which met at St. Louis, Mo., June 18, nominated for the presidency William McKinley, of Ohio; for Vice-President Garret A. Hobart, of New Jersey, and declared in favor of the maintenance of the present gold standard, and against free silver except under international agreement. The adoption of this plank led at once to the withdrawal of Senator Teller and most of the delegates from the silver-producing States of the West. At the Democratic convention, held in Chicago, July 10, William J. Bryan, of Nebraska, was nominated for President, and Arthur Sewall, of Maine, for Vice-President, and free silver was made the paramount issue. No bolt occurred then, but later (Sept. 3) a large number of delegates representing the "sound-money" wing of the Democratic party met at Indianapolis under the name of the National Democratic party, adopted a simple platform, in which the maintenance of the present

gold standard was the principal plank. For President they nominated John M. Palmer, of Illinois, and for Vice-President Simon M. Buckner, of Kentucky. The People's (or Populist) party assembled in national convention at St. Louis, Mo., July 22, and nominated W. J. Bryan for President and Thomas E. Watson, of Georgia, for Vice-President. The principal plank in their platform demanded "the free and unlimited coinage of silver at the present legal ratio of 16 to 1, without waiting for the consent of foreign nations. The results of the elections are given on page 47. See UNITED STATES in the Appendix.

AUTHORITIES.—See the official publications, bulletins, and reports issued by the various departments and bureaus of the U. S. Government; and the unofficial annuals devoted in whole or in part to subjects connected with the U. S., such as Appletons' *Annual Cyclopædia* and Poor's *Manual of the Railroads of the United States*, and the almanacs, giving statistical information, published by newspapers (e. g. those by the New York *Tribune* and *World*, the Chicago *Tribune*, and the Brooklyn *Eagle*); Bryce's *American Commonwealth* (London, 1893); *Civil Government in the United States*, by John Fiske (1890); J. Macy, *Our Government* (1886); N. S. Shaler, *The United States of America* (1894); Josiah H. Strong, *Our Country* (1894); Henry Gannett, *Building of a Nation* (1895); Appletons' *General Guide to the United States*; Baedecker's *United States*; etc.

Winsor's *Narrative and Critical History of America* (8 vols.); Bancroft's *History of the United States*, and his *History of the Constitution of the United States*; Hildreth's *History of the United States*; Lodge's *Short History of the American Colonies*; Frothingham's *Rise of the Republic*; Schouler's *History of the United States under the Constitution* (6 vols.); McMaster's *History of the People of the United States* (6 vols.); Parkman's *Works* (12 vols.); Fiske's *Discovery of America*, *Beginnings of New England*, *American Revolution*, and *Critical Period of American History*, 1783–89; Winsor's *Handbook of the Revolution*; Eggleston's *The Beginners of a Nation* (1897); Henry Adams's *History of the United States* under Adams and Jefferson (9 vols.); Roosevelt's *Winning of the West* (6 vols.); Hinsdale's *Old Northwest* (1 vol.); H. H. Bancroft's 39 vols. on the history of the Pacific coast; and Von Holst's *Constitutional History of the United States*, from 1781 to 1861 (9 vols.). For the civil war, see works by the Count of Paris, Greeley, Nicolay and Hay, Stevens, Davis, and Grant. Of the works designed specially for the use of schools, The Epoch Series of Thwaites, Hart, and Wilson, and The American History Series of Fisher, Sloane, Walker, and Burgess; The American Statesman Series, the Great Commanders Series, and the American Commonwealth Series. See also Jameson's *Dictionary of United States History*, 1492–1894. For lists of works on special topics and periods, see Adams's *Manual of Historical Literature*. HENRY GANNETT,
FRANCIS A. WALKER, C. K. ADAMS.

United States Bank: See BANK.

United States Christian Commission: See CHRISTIAN COMMISSION.

United States Homestead Legislation: See HOMESTEAD LAWS.

United States, Literature of: See ENGLISH LITERATURE and NEWSPAPERS.

United States Military Academy: See MILITARY ACADEMIES.

United States Naval Academy: See NAVAL ACADEMIES.

United States of Brazil: See BRAZIL, UNITED STATES OF.

United States of Colombia: See COLOMBIA (*History*).

United States of Mexico: See MEXICO.

United States of Venezuela: See VENEZUELA.

United States Sanitary Commission: See SANITARY COMMISSION, UNITED STATES.

United Synod of the Presbyterian Church: the name taken by the Southern members of the New School Presbyterian Church in the U. S. who withdrew in 1858. See PRESBYTERIAN CHURCH.

United Syrians: in general, a body of Christians who, together with the Chaldæans, the Maronites, and the United St. Thomas Christians, comprise the Syrian rite in the Eastern rite of the Roman Catholic Church; more particularly, the converts from the Jacobite or Monophysite Church in Syria, usually known as Syrian Catholics. The United Syrians have a patriarch at Aleppo, styled Patriarch of Antioch, and Archbishops of Aleppo, Babylon, Damascus, and Seleucia, besides eleven bishops. They number about 30,000. They date from the sixteenth century, when (1546) one of their congregation was converted to the Catholic Church. In 1650 the Capuchins converted Achigian, the Jacobite Bishop of Aleppo. The movement of conversion, however, dates chiefly from the end of the eighteenth century. The Patriarch of Aleppo has jurisdiction over the Syrian Catholics of Syria, Mesopotamia, and Egypt, but is himself immediately subject to the Propaganda and to the vicar-apostolic of Aleppo as apostolic delegate. See Silbernagl, *Kirchen des Orients*; *Gerarchia Cattolica* for 1895; O. Werner, S. J., *Orbis Terrarum Catholicus*. See also MARONITES, CHALDÆAN CHRISTIANS, EASTERN RITE, and UNITED CHRISTIANS OF ST. THOMAS. Revised by J. J. KEANE.

Unities, THE DRAMATIC: fundamental principles supposed to appear in every artistic dramatic composition. As finally elaborated, the Unities were three in number—Unity of Action, Unity of Time (or of the Day), and Unity of Place. Insistence on the rigid observations of these principles is preeminently to be found in the French dramatists and critics of the seventeenth and eighteenth centuries, beginning with Corneille. These writers, however, believed that they were but restating laws that had governed the Greek and Latin dramas, and that had first been definitely formulated by Aristotle in his treatise on the *Poetics*. To this work, therefore, we must turn, if we would rightly understand the origin and meaning of the conceptions designated as the Dramatic Unities.

In the *Poetics* (which, it must be remembered, is not a completed work, but rather a series of not wholly harmonized notes and observations), Aristotle discusses at greatest length two forms of poetry—epic and dramatic. His method is at once inductive and synthetic. The materials used for induction were the Homeric poems and the already existing plays of the greatest Greek dramatists, Æschylus, Sophocles, and Euripides. The synthetic, or constructive, part of the treatment, on the other hand, was largely determined by the analogy that Aristotle felt to exist between art and nature, the creations of the poet and the living forms of the natural world. His observations on the drama, accordingly, need careful discrimination to avoid the confusion of generalizations derived from the limited forms of the drama known to him, with principles believed by him to exist of necessity in all successful works of art, by reason of the organic character of true artistic creation.

To this latter class of principles belongs the one form of dramatic unity that Aristotle most insists upon, and indeed alone treats as absolutely indispensable, namely, Unity of the Action (πρᾶξις). The one primal necessity of any organic form of life whatever is that it be clearly separated and distinguished from what is unbounded (ἄπειρον), undefined, indeterminate. It must be in itself one (ἕν), a whole (ὅλον). The various parts of it must belong functionally together; they must tend to a single total result or end (τέλος). Hence Aristotle's definition of tragedy (*Poetics*, ch. vii.): "Tragedy is an imitation of an action that is complete and whole and of a certain magnitude; for there may be a whole that is wanting in magnitude. A whole is that which has beginning, middle, and end. A beginning is that which does not itself follow anything by causal necessity, but after which something naturally is or comes to be. An end, on the contrary, is that which itself naturally follows some other thing, either by necessity or in the regular course of events, but has nothing following it. A middle is that which follows something, as some other thing follows it." These definitions have at first sight the appearance of too great obviousness, yet in them is really to be found Aristotle's whole theory of art. His "beginning," "middle," and "end" by no means express mere consecutiveness of events. Rather he indicates by them a certain body of fact, bounded and limited in contrast with the variety of fact in the universe, but at the same time tied together by the closest bonds of causality. As Lowell has excellently put it (*The Old English Dramatists*, p. 55): "In a play we not only expect a succession of scenes, but that each scene should lead, by a logic more or less stringent, if not to the next, at any rate to something that is to follow, and that all should contribute their fraction of impulse toward the inevitable catastrophe. That is to say, the structure should be organic, with a necessary and harmonious connection and relation of parts, and not merely mechanical, with an arbitrary or haphazard joining of

one part to another. It is in the former sense alone that any production can be called a work of art."

Of quite a different character is Aristotle's Unity of Time, in so far as he has formulated it at all. The necessities of the Greek stage were such that a dramatic story had to be told upon it in a highly concentrated form. The Athenian audience, furthermore, was in general perfectly familiar with the themes employed by the dramatists, and had not to be informed of all the long preliminaries that led up to the tragic situation. The development of character, too, which requires some lapse of time, was severely subordinated to the plot. As Aristotle says (*Poetics*, ch. vi.): "The Plot, then, is the first principle, and, as it were, the soul of tragedy; character holds the second place." Consequently, the best, though by no means all, of the Greek tragedies familiar to Aristotle depicted merely the brief final moment, the catastrophe, of the life of the hero. He was led, therefore, to make the empirical statement (*Poetics*, ch. iv.), that "tragedy endeavors, as far as possible, to confine itself to a single revolution of the sun, or but slightly to exceed this limit; whereas the epic action has no limits of time; . . . though at first the same freedom was admitted in tragedy, as in epic poetry." From this statement, and this alone, modern critics have derived the principle of Unity of Time.

Even less substantial is the Unity of Place. Aristotle does not mention it at all. Most of the existing Greek tragedies, to be sure, show it, probably because the chorus regularly consisted of onlookers whose character remained unchanged throughout the piece, and whose songs embodied the reflections of the community in which the tragic catastrophe was supposed to occur. This, however, is clearly an accidental feature of the Athenian drama, quite unconnected with any inner principle. In modern times it has chiefly been defended as a logical deduction from the Unity of Time, though the logic is far from close or compulsive.

The importance of the Unities in modern discussions of the drama is largely due to the exaggerated authority attributed during the Renaissance to all utterances of the classical world. It was in Italy, early in the sixteenth century, that Aristotle's *Poetics* began to be studied as the basis of the art of poetry. A Latin translation by G. Valla was printed in Venice in 1498, and the Aldine *editio princeps* of the Greek text appeared in 1508. These were followed by the Latin translations, Anon. (Venice, 1515), A. Pazzi (Venice, 1536); and the Italian versions of B. Segni (Florence, 1549), L. Castelvetro (Vienna, 1570), and A. Piccolomini (Venice, 1575). Besides these appeared Fr. Robortelli's *In librum Aristotelis de Arte Poetica explicationes* (Florence, 1548); V. Maggi's *In Aristotelis librum de Poetica explanationes* (Venice, 1550); and P. Vettori's *Commentationes in primum librum Aristotelis de Arte Poetarum* (Florence, 1560). The Italian criticism of the time fully reflects the great interest implied by these numerous versions and comments. By the end of the century no cultivated Italian ventured to doubt the authority of the principles Aristotle was supposed to have laid down. From Italy the discussion passed into France. In the middle of the same century Ronsard and his school, the Pléiade, in their eagerness to establish classicism in French literature, made much of the dicta of the treatise, though they but partially understood them and poorly applied them. The tragedies of Seneca, however, which alone among ancient plays they really knew, from their triviality and essentially literary rather than dramatic character, seemed to bear out fully Aristotle's principles. In the next century, the seventeenth, however, the doctrine of the Unities found an advocate in Corneille, who in his *Cid* gave the first example of a play in which they were strictly observed. The genius of Racine still more completely established their authority, and they held undisputed sway in France for nearly two hundred years. England and Germany (and to a less extent Spain) also submitted to their rule, and not till the romantic movement of the nineteenth century was their absoluteness called seriously into question.

The best discussion of the real meaning of Aristotle's principles is to be found in S. H. Butcher, *Aristotle's Theory of Poetry and Fine Art, with Critical Text and Translation of the Poetics* (London, 1895). Much of value is to be found in the notes of T. Twining, *Aristotle's Treatise on Poetry, translated with Notes* (London, 1789). For the discussion of the Unities by Corneille and his school, see the *Discours* of Corneille, especially *Discours III., Des trois Unités.* See also Heinrich Breitinger, *Les unités d'Aristote avant le Cid de Corneille* (Geneva, 1879). A. R. MARSH.

Units [*unit* is shortened from *unity*, from Lat. *u'nitas*, oneness, unity, deriv. of *u'nus*, one]: certain known quantities, of the same kind as the quantities to be measured, taken as standards of reference. The numerical value of a concrete quantity is the number of such units which the quantity contains. Every expression for a quantity consists, therefore, of two factors—the numeric and the unit. Thus 10 feet, 50 grammes, 30 seconds.

FUNDAMENTAL UNITS.

A system of units contains as many different ones as there are quantities to be measured; they may be quite arbitrary, but it is convenient to connect them together in such a manner that they may be defined in terms of three arbitrary or underived units. These are called *fundamental units* in distinction from all others, which in turn are called *derived units.* The fundamental units adopted in science are those of *length*, *mass*, and *time.* This particular selection is a matter of convenience, and rests upon several considerations which have properly determined their choice.

The standard unit of length in Great Britain is the imperial *yard*: in the U. S. it is the distance between the 27th and the 63d inch divisions of the Troughton scale. This at 59·6° C. is equal to the imperial yard. In France the unit of length is the *mètre des archives.* The standard of mass in Great Britain is the *avoirdupois pound*; in the U. S. it is the "troy pound of the mint," according to which the coinage of the U. S. is regulated. It is a certified copy of the lost imperial standard of 1758, and contains 5,760 grains. The avoirdupois pound adopted by the Treasury was derived from the troy pound and contains 7,000 grains. In France the unit of mass is the *kilogramme des archives.*

By act of Congress in 1866 the meter was defined to be 39·37 inches. The weights and measures of the metric system are lawful in the U. S., and the standards of length and mass are the "national prototypes" of the meter and the kilogramme, made by an international commission, and preserved at the Bureau of Weights and Measures in Washington. They were authorized by a metric convention which was signed at Paris by the representatives of seventeen governments on May 20, 1875. See WEIGHTS AND MEASURES.

The universal unit of time is the *second* of mean solar time. The C. G. S. or *centimeter-gramme-second* system is based upon the centimeter, the gramme, and the second as the fundamental units. It was proposed by the British Association for the Advancement of Science in 1861.

DERIVED UNITS.

A. *Mechanical.*—The derived units will be defined in the C. G. S. system. The corresponding units for any other system are easily derived from them.

The *unit of area*, the square centimeter, the area of a square with sides 1 cm. long; *unit volume*, the cubic centimeter, the volume of a cube with edges 1 cm. long; *unit velocity*, the velocity of a body moving through 1 cm. in 1 sec.; *unit of acceleration*, the acceleration which in 1 sec. produces an increase in velocity of 1 cm. a second; *unit force*, the *dyne*, or that force which acting on a mass of 1 gramme generates a velocity of 1 cm. per second (see DYNAMICS); *unit of work* and *energy*, the *erg*, the work done or the energy expended by 1 dyne through 1 cm.; *unit of power*, the power represented by the expenditure of 1 erg per second.

B. *Electrical and Magnetic.*—Electrical units are either electrostatic or electromagnetic. The electrostatic units are based upon the phenomenon of the attraction and repulsion between charges of electricity, the law of which was established by Coulomb. The electromagnetic units are based upon the phenomenon of the magnetic field produced by a current, and they are derived from the definition of unit magnetic pole. All electrical units may be defined in either system.

The *electrostatic units* are as follows: *Unit quantity*, the quantity which repels an equal and similar quantity at a distance of 1 cm. with a force of 1 dyne; *unit difference of potential* between two points, a difference such that 1 erg of work is expended in moving unit quantity from one point to the other; *unit current*, a current conveying unit quantity in 1 sec.; *unit capacity*, the capacity of a conductor which is charged to unit potential by unit quantity. See POTENTIAL.

The *electromagnetic units* are as follows: *Unit magnetic pole*, a magnetic pole which repels an equal and similar pole at a distance of 1 cm. with a force of 1 dyne; *unit magnetic*

field, a field in which unit pole is acted upon by a force of 1 dyne; *unit current*, a current which, flowing in a circle of 1 cm. radius, produces at its center a magnetic field of 2π units; *unit magnetizing force*, a magnetizing force producing unit magnetic field, equivalent to $\frac{10}{4}\pi$ ampere-turns per centimeter length; *unit electromotive force* (E. M. F.), the electromotive force which does 1 erg of work per second when unit current is flowing; *unit resistance*, the resistance of a circuit in which unit E. M. F. produces unit current.

C. *Practical Units.*—Since some of the C. G. S. units are inconveniently large and others inconveniently small, the practical units are some multiple or sub-multiple of ten times the corresponding C. G. S. units of the electromagnetic system. The practical units defined by the International Electrical Congress at Chicago, 1893, are as follows: *Unit of resistance*, the *ohm*, represented by the resistance offered to an unvarying current by a column of mercury at the temperature of melting ice and 14·4521 grammes in mass, of a constant cross-sectional area, and 106·3 cm. in length; *unit of current*, the *ampere*, which is the practical equivalent of the unvarying current, which, when passed through a solution of silver nitrate in water, deposits silver at the rate of 0·001118 gm. per second; *unit of electromotive force*, the *volt*, or the E. M. F. that, steadily applied to a conductor whose resistance is 1 ohm, will produce a current of 1 ampere; it is equivalent to $\frac{1000}{1434}$ of the E. M. F. of the Clark cell at a temperature of 15° C.; *unit of quantity*, the *coulomb*, which is the quantity transferred by 1 ampere in 1 sec.; *unit of capacity*, the *farad*, the capacity of a condenser charged to a potential of 1 volt by 1 coulomb; *unit of work*, the *joule*, the energy expended in 1 sec. by an ampere in an ohm; *unit of power*, the *watt*, the work done at the rate of 1 joule per second; *unit of induction*, the *henry*, the induction in a circuit when the E. M. F. induced is 1 volt while the inducing current varies at the rate of 1 ampere per second.

The relation between these practical units and the C. G. S. units is set forth in the following table:

PHYSICAL QUANTITY.	Practical unit.	RATIO OF PRACTICAL TO C. G. S. UNITS.	
		Electromagnetic.	Electrostatic.
Quantity	Coulomb	10^{-1}	3×10^{9}
Current	Ampere	10^{-1}	3×10^{9}
Electromotive force	Volt	10^{9}	$\frac{1}{3}\times10^{-2}$
Resistance	Ohm	10^{9}	
Capacity	Farad	10^{-9}	9×10^{11}
Induction	Henry	10^{9}	
Work	Joule	10^{7}	
Power	Watt	10^{7}	

HENRY S. CARHART.

Universal Expositions: See EXPOSITIONS, INTERNATIONAL.

Univer'salism [from Lat. *universa'lis*, of or belonging to all or to the whole, universal, deriv. of *univer'sus*, all together, whole, entire, liter., turned into one; *u'nus*, one + *ver'tere*, *ver'sum*, turn]: in theology, the doctrine that all mankind will finally attain salvation. Stated more fully, the beliefs which constitute this doctrine are: that God is; that his infinite power, wisdom, and justice are modes of his essential nature, which is love; that he holds to man the relations of Creator and Father; that he is manifested through his works and providence; that he has disclosed through holy men, and especially through Jesus Christ, his character, will, and purpose as related to the duty and destiny of man; that he is continually working upon mankind through his cosmic and ethical forces, and by his Holy Spirit of truth, faith, hope, and love; and that thus guided and inspired, all his children will eventually clear themselves from evil and achieve perfected character with its resulting power, peace, and joy—so that a final moral harmony of the universe will be attained, and God will be all in all.

Man.—It is held by Universalists that man is not under the wrath and curse of God for the sins of his ancestors, but that he is under the difficulties and dangers of inherited and acquired incompleteness and defect; that his chief peril, the real, demonstrable hell into which he may fall, is degeneration—the failure to live up to his organic capacity; that the evils in which he is enmeshed are, however, challengers of his strength; that pain is the great stimulus of his energy—the prolonged birth-pang of his higher powers; and that his agonizing conflict with evil is but the fair price of perfected character and enduring life. Universalism emphasizes the importance of faith in man as the chief work of God and the highest organism in the visible creation; and it contributes to the Christian creeds this new article of faith: "We believe that man is created in the spiritual image of God, and is capable of knowing and doing his will." It is affirmed that man is not a fallen being, a worm, a slave, a wreck, but a developing being who began low down and is on his way up, not a ruin, but a mine full of latent riches. His capacities are great, some of them are sublime; he is God's fellow-worker, co-operator, and agent, through whom the divine purposes are wrought out on earth. God furnishes the arena, the organism, the constant inspirations, but man does the work, and in doing it he develops the one thing which God does not create, namely—character. Universalism affirms the spiritual unity of the race, and the universality and essential ethical identity of all of God's revelations to man.

Salvation.—It is held that moral development is not confined to the present state of existence, but is conterminous with the whole duration of man; that salvation consists in the formation of a character conformed to God's will; that such character can not be instantaneously acquired, nor produced in any other way than by the voluntary action of the individual; that rewards and punishments are aids to the development of character and not ends or finalities; that God's love is as clearly shown in penalty as in reward, since, by the return of his deeds upon his head, man is made aware that there is Somebody in the universe who cares which way he goes; that punishment is medicinal and corrective; that the remission of the penalties of voluntary disobedience would be unmerciful; that forgiveness does not involve such remission, but works a change in the attitude of the soul which enables the sinner to endure the consequences of his sin in such a way that they will ennoble, instead of degrading him. Universalism affirms that the revelation of the divine character through the Christ is the most potent awakener of the moral energy of men; that the chief function of the Church of Christ is to hold his ideal of life and character before men and assist them to attain it; that man can not find salvation by withdrawing from the sphere of life's appointed activities and duties, but that the great school of moral discipline and spiritual culture is to be found in the common personal relationships and ordinary pursuits of life.

The Bible.—The Universalist Confession of Faith says: "We believe that the Holy Scriptures of the Old and New Testaments contain a revelation of the character of God, and of the duty, interest, and final destination of mankind." It is held that the moral and spiritual content of the Bible constitutes a progressive revelation; that it is adapted to the successive stages of man's development; that, since a revelation must necessarily be intelligible to those to whom it is addressed, the Bible must be interpreted according to the present canons of historical criticism and in the terms of man's present understanding and conscience; that it contains a record of man's spiritual experience and moral growth through many ages under the tuition of God's Spirit; and that it stands pre-eminent in its power of communicating moral energy to the struggling souls of men.

Methods.—It is held that all moral transformation and growth is from within outward; that the incarnation of God in Christ is representative of the possibility of the indwelling of God's Spirit in all men; that every soul is capable of receiving that Spirit; that the entrance of the divine life into humanity is not an exceptional, official, or magical act, but a process whose laws can, to a large extent, be discerned and obeyed; and that repentance of sin, the worship of God, loyalty to the Christ, the service of men, the diligent discharge of humble duty, and the honoring of the common relationships of life, are all channels through which the soul may receive in ever-increasing measure that divine energy which lifts it out of the power of sin and sorrow, and forwards it on the way to perfection.

Resurrection and the Future Life.—It is held that the resurrection is experienced by each soul when, at the dissolution of the body, it enters upon a new order of existence. It is not conceived that death works any moral transformation, but that the soul enters the next state with just the spiritual character which it achieved on earth. It is believed that in the future life all the opportunities for further growth which the powers of the soul open to it will be accorded; that it will there be under the ministry of truth and love, until truth and love have wrought within and upon it their perfect work.

Historical.—Universalism in its essential features dates from a high antiquity in the Christian Church. It was

held by Clement of Alexandria (A. D. 190), by the great and learned Origen (A. D. 225), and a little later by Theodore of Mopsuestia, and others. When the Latin form of Christianity triumphed over the Greek form, and Rome gained supremacy, the doctrine of purgatory gradually superseded the Universalist belief in moral progress beyond death. In the rigors of the Reformation, the recoil from the abuses of the doctrine of purgatory took the form of a rigid denial of the possibility of any moral change after death. But through all this period Universalism had its isolated scholars and saints, and the reformed Christianity produced many able and devoted advocates of the universal hope, in Germany, France, and England. Universalism began its development in America in the last half of the seventeenth and the first half of the eighteenth centuries, through certain English and French Mystics, through the German Brethren, the Moravians, and through a few learned divines of the Episcopalian and Congregationalist bodies. John Murray came from England in 1770, and began to proclaim it openly. Its doctrines spread rapidly, but it acquired institutional power slowly. The organization of the Universalist branch of the Christian Church in America was accomplished in 1803, at Winchester, N. H., by the adoption of a confession of faith and the acquisition of a legal status. The Church now (1900) numbers more than 1,000 parishes, organized under forty State conventions and one general convention; owns church property worth over $9,000,000, besides nearly $4,000,000 invested in educational institutions, which comprise four colleges, one polytechnic institute, three divinity schools, and five seminaries and academies.

References.—For detailed information and statistics, see *The Universalist Register*, Boston, published annually; for history, Hosea Ballou, *The Ancient History of Universalism* (Boston, 1878); Richard Eddy, *Universalism in America* (2 vols., Boston, 1886); for doctrine, Thomas B. Thayer, *The Theology of Universalism* (Boston, 1870); Samuel Cox, *Salvator Mundi* (London, 1874); Frederic W. Farrar, *Mercy and Judgment* (New York, 1881); *The Columbian Universalist Congress* (Boston, 1893); Joseph S. Dodge, *The Purpose of God* (Boston, 1894); O. Cone, *Gospel Criticism and Historical Christianity* (New York, 1891).

James M. Pullman.

Universals [from Lat. *universa'lia*, neut. plur. of *universa'lis*, belonging to the whole, collective, general. See Universalism]: a term used in various ways. Universals are either metaphysical, *universalia ante rem*, denoting the archetypal forms of things as far as they existed in the Divine Mind before the real things were created; or physical, *universalia in rem*, denoting the archetypal forms as far as they actually exist in things created; and finally logical, *universalia post rem*, denoting the archetypal forms as far as they are abstracted by the human intellect from the things. See Realism, Nominalists, and Generalization.

Revised by W. T. Harris.

Universe [from Lat. *univer'sum*, all things, the universe, liter., neut. of *univer'sus*, all together, whole, entire. See Universalism]: a term employed to signify the grand and total aggregate of created things.

Regarding this aggregate as a material structure, it is, so far as we know, made up of what we familiarly call the heavenly bodies. Particulars respecting these bodies and the systems which they form are found in the articles Astronomy, Asteroid, Comets, Nebulæ, Planet, Solar System, Stars, and Sun. In this article is summed up what may be said of the whole creation.

When the telescope was pointed at the heavenly bodies, and the law and consequences of gravitation developed by Newton and his successors, the universe was, in thought, divided into two parts. There was first our solar system, composed of a definite number of bodies, of which the sun was much the greatest; and there was outside this system another, composed of countless stars, seemingly scattered through all space. The void space between the outermost planet and the nearer stars, which to the early astronomers seemed not very wide, became, as astronomical research was continued, of immeasurable extent. After Herschel explored the heavens with his great telescopes, it became continually clearer that our sun was in reality simply one of the millions of those shining bodies called stars. In other words, it became clear that the stars were suns. The natural outcome of this conception, aided by measures of parallax, was the conclusion that the distance between our sun and the nearer surrounding stars was perhaps no greater than that which separated most of the stars from each other. Photometric measures, combined with determinations of the parallax of the stars, have shown that our sun is probably rather a small star, whose actual brightness is exceeded manifold by Sirius, and perhaps by a majority of the stars which stud the heavens. Our conclusion is that a being flying through the entire universe, and scanning its great bodies as he passed, would notice our sun merely as one among the millions of those bodies.

Lambert's Theory.—Even before all these conclusions were fully established, Lambert formed the sublimest conception of the universe that has yet entered into the mind of man. We see that our solar system is made up of a number of minor systems. Each of the latter is formed by a planet, with its attendant satellites, when it has any. Each of these systems revolves around the great central luminary, the sun, preserving its general form through all ages. So far as we can see, the solar system, as thus constituted, is fitted to endure forever. Should an inhabitant of the earth visit our system at the end of any number of æons, the presumption is that he would still find all the planets revolving around the sun in their regular order, each with its attendant satellites, under the same laws which now direct their motions. The similarity of the stars to the sun being established, the presumption is that each of the former is the center of a system of planets. A number of the stars, each with its attendant planets, may revolve around some great unknown center, forming a system of yet higher order. Each cluster of stars was supposed to be such a system. All these clusters or systems which our telescopes can see may again revolve around a yet greater center. Thus Lambert reached the conception of a universal system including all created bodies, and fitted to endure forever without undergoing any change in its general arrangement.

The Stars Irregular in Motion.—Sublime though this conception is, it is not verified by modern research. Not only is there no evidence that the stars as a whole form an organized system of the kind we have described, but it is only in the exceptional cases of binary or ternary systems that two or three stars are seen to have any relation to each other. The proof is very simple. Were the stars thus aggregated into systems, we should see a certain regularity in their motions, by which we could form some idea of the center around which each revolved. But no such regularity can be detected. The general rule is that each star seems to be moving forward in a straight line entirely independent of the lines of motion of other stars. The only modification that this statement requires is that in many cases a number of stars in the same region of the heavens seem to have the same proper motion. Of these, we may say that they are moving through space together. But even in these cases there is no such orderly arrangement among them as there would be if they formed a system in any way like our solar system. If any orbit is being described, either by the individual stars or by star clusters, many thousands of years of observation will be required to make it out, and in all probability it would be found to be not an orbit of any definite form, but only an irregular curve, determined by the attraction of great numbers of other stars.

This view is still further strengthened by the widest generalization of modern science, that of the dissipation of energy. If we admit that the law of the conservation of energy and of the correlation of its different forms, which is established by our experiments and observations on the earth's surface as one of the most universal and far-reaching laws of nature, holds good throughout the whole universe, and in all time, then we must admit that the life of all the stars is finite; that at a certain time in the past, very long when measured by human life, yet not long when measured by geological ages, a time only a small number of millions or hundreds of millions of years back, the stars did not exist in their present form, but were great nebulous masses, filling the space now occupied by the universe. Looking forward, the same considerations lead us to the conclusion that before a system organized on the plan supposed by Lambert could make many revolutions, the heat and light of the component stars, which is their life, would come to an end. From this point of view, the motions among the stars are merely a continuation of the motions of the nebulous masses which originally formed them, modified in each case by the attraction, more or less great, of innumerable other stars.

The Universe probably Finite in Extent.—Assuming this

conclusion, two questions arise. First, is the universe of stars infinite in extent? Every addition to the power of our telescopes reveals new and probably more distant bodies. If this power were increased without limit, would we continually find yet more distant stars, without end, or would we at length reach a boundary to the whole system beyond which is only empty space? This question was answered both in the positive and negative by Kant, in one of his Antinomies. He proved both the positive and the negative by what seemed to him equally conclusive reasoning. The modern scientific philosopher would set aside both courses of reasoning as necessarily inconclusive, because the question is one of fact, which can be settled only by observation, and observations are not yet sufficiently comprehensive to settle it. We may, however, take a step toward doing so. Were an infinite number of stars scattered through space in such a way that every region of fixed size, however great, would in a general average contain one or more stars, then it can be shown by mathematical reasoning that these stars would fill the heavens with a blaze of light like that of the noonday sun. We may therefore say conclusively that either the universe, as we understand it, is finite in extent or that the light of the stars does not travel through infinite space. The former conclusion is that most in consonance with the ideas of modern science. But this does not prove that there is a boundary beyond which no stars exist. It shows the finitude only of the collection of stars, a few of which are within the reach of our telescopes. In the infinite depths beyond may lie other stars and systems without end.

Arrangement of the Stars and Nebulæ.—Granting this conclusion, which is that the 50,000,000 of stars and the unknown masses of nebulæ which are visible with the most powerful telescopes of our time form at least a considerable part of a system of stars scattered within a limited region of space, we meet the second question. Should a being view this collection of stars from a point outside of it, what form would it present? In other words, what is the actual arrangement of the stars and nebulæ in space? This question we can partially answer. The great majority of stars visible with the telescope are seen in the region of the Milky Way. It follows that the great mass of stars which compose the universe are, so far as our telescopes show them, not arranged spherically, but rather form a flat disk; possibly a great number of them form a ring. Our sun appears to be situated nearer to the center of this ring than to its circumference. On the two sides of the disk or ring are scattered comparatively few stars, but a great number of nebulæ. Adopting the modern views of cosmogony, these nebulæ are ultimately to condense into stars. In this arrangement of a disk or ring of closely connected stars, with numerous scattered stars lying all around on each side and in the center, and nebulæ arranged on either side, we have the closest approach to a system that modern science can yet see in the arrangement of the universe. S. NEWCOMB.

University: an institution for the promotion of higher education by means of instruction, the encouragement of literary and scientific investigation, the collection of books and apparatus, and the bestowal of degrees. The term has had a different meaning in different ages and in different countries. In Latin it conveyed some such idea as our word incorporation, the totality of a society formally organized by a recognized authority. The dictionaries give various illustrations, among them the phrase *Incolarum Oppidi Universitas*, the corporation of a city. From this meaning of the whole or entirety of a society the term became restricted to a body of masters and students associated for learning, and then it came to signify that all departments of knowledge were studied. It is true that in the Middle Ages the idea of a place for general education was expressed by *Studium Generale*, a seminary where higher studies were pursued in many fields. Denifle has discovered the use of this phrase in 1233–34; yet he has found a still earlier use of the word university in its modern academic sense. *Universitas Magistrorum* (interpreted by the words *Communio Magistrorum*) occurs in a rescript of Pope Innocent III. to the Parisians, dated in 1208–09; and a few years later, in 1221, the formal title appears in the statutes, *Nos, Universitas Magistrorum et Scholarium Parisiensium.* So it is safe to say that the word, in the sense of a society of scholars, dates from the early part of the thirteenth century. Amid the differences that have developed respecting the legitimate authority, scope, subdivision, statutes, and usages of universities, one idea has never disappeared. Since their origin, universities have been organizations in which students were taught the highest branches of knowledge. Moreover, universities have been places where man's inheritance from the past has been preserved and interpreted to living generations. Independence of thought, habits of inquiry, investigation, and research, and the art of reasoning have been encouraged or developed within their walls—not always with fervor, it must be conceded, yet perpetually, according to the light of each passing age. The university, everywhere and always, has been a society of masters and scholars associated for the acquisition and advancement of knowledge. It may be more; it must be this.

As education has advanced, and especially as instruction has been provided in many technical branches which call for the ablest intellectual exertion, the word university has come to imply advanced instruction, given by superior teachers to well-qualified students, in very wide domains of knowledge. In almost every civilized land the work of a university is supposed to rest upon that of a preliminary or introductory college, gymnasium, or *lycée.* In the U. S. an unfortunate confusion has resulted from the occasional adoption of the term university by institutions which, however excellent in their work, represented a lower grade of instruction than that which is given in the best European and American universities.

Distinction between a College and a University.—The college is understood to be a place for the orderly training of youth in those elements of learning which should underlie all liberal and professional culture. Ordinarily the conferring of the bachelor's degree marks the conclusion of the college course. Often, but not necessarily, the college provides for the ecclesiastical and religious as well as the intellectual training of its scholars. Its scheme admits but little choice. Frequent daily drill in languages, mathematics, and science, with compulsory attendance and repeated formal examinations, is the discipline to which each student is submitted. Often (especially in France, England, and the U. S.) the students of this grade are provided with lodgings and sustenance by the college authorities. This work is simple, methodical, and comparatively inexpensive. It is everywhere understood and appreciated.

In the university, more advanced instruction is given to those who have already received a college training or its equivalent, and who afterward desire to concentrate their attention upon special departments of learning and research. Libraries, laboratories, and apparatus require to be liberally provided and maintained. The holders of professional chairs must be expected and encouraged to advance by positive researches the sciences to which they are devoted, and arrangements must be made in some way to publish and bring before the criticism of the world the results of such investigations. Primarily, instruction is the duty of the professor in a university as it is in a college; but university students should be so mature and so well trained as to exact from their teachers the most advanced instruction, and even to quicken and inspire by their appreciative responses the investigations which their professors undertake. Such work is costly and complex; it varies with time, place, and teacher; it may be remote from popular sympathy, and it is of course liable to be depreciated by the ignorant and thoughtless. Nevertheless it is by the influence of universities, with their comprehensive libraries, their costly instruments, their stimulating associations and helpful criticisms, and especially their great professors, indifferent to popular applause, superior to authoritative dicta, devoted to the discovery and revelation of truth, that knowledge has been promoted, and society released from the fetters of superstition and the trammels of ignorance, ever since the revival of letters.

The Idea of Liberal Studies.—We are not to suppose that universities did not exist in antiquity because this word, in its academic sense, is of mediæval origin. From the time of Aristotle and Plato until now the idea of "liberal" studies in distinction from those that are "practical" has been handed down. Thoughtful men have recognized the fact that many things must be learned without reference to their professional or technical profit. Intellectual strength, enjoyment, sagacity are worthy to be cultivated, quite as much as skill in turning one's knowledge to account. In modern times it is held that any study may be pursued either with freedom or in a restricted and narrow spirit, and consequently that a liberal education does not depend so much upon the subjects that are taught as upon the ways in which

they are taught. In the Middle Ages also, it may be said, methods were all in all; but the methods were anything but liberal. The written texts, even such inadequate texts as translations, commentaries, and glosses, were the ultimate appeal. Such an idea as that of scientific verification, or of reference to and dependence upon original sources of knowledge, in the modern sense, was rarely proposed; and those who suggested this method of establishing the truth were liable to be silenced by the portentous utterance, *Scriptum est.*

The doctrine of liberal studies is distinctly stated in the fourth and fifth books of Aristotle's *Politics* (cf. Welldon). Proceeding from the dictum that all life is divided into business and leisure, he says that "there is a certain education which our sons should receive, not as being practically useful nor as indispensable, but as liberal and noble"; and again, "the universal pursuit of utility is far from becoming to magnanimous and free spirits." From the time of the ancient Greeks different schedules of the liberal arts have been given. The number seven is first clearly indicated about the beginning of the sixth century by Martianus Capella, who enumerates grammar, dialectic, rhetoric, geometry, arithmetic, astronomy, and music. Of these, the three first named constitute the *trivium*; the four last named, the *quadrivium*. Cassiodorus (468–568) finds a suggestion of this mystical group in a verse of the book of Proverbs, which reads: "Wisdom hath builded her house. She hath hewn out her seven pillars." Much curious lore upon these points, collected by Prof. A. F. West in the Princeton College *Bulletin* (1890), is reproduced in Davidson's *Aristotle and the Ancient Educational Ideals*. Gradually the trivium and the quadrivium were crystallized in educational systems. The fourteenth and fifteenth chapters of the second book of Dante's *Convito* illustrate the scope of liberal studies in his time. The seven sciences of the trivium and the quadrivium are here represented as like unto the seven heavens. To the eighth sphere, the starry heaven, physics, and metaphysics correspond; to the ninth, moral science; and to the tenth or quiet heaven, divine science or theology. Davidson has reduced these ideas to a formal schedule in the appendix of his *Aristotle*, and he adds the remark that here we have the culmination of the ancient and mediæval systems of education. The schedule is worth reproducing as a significant landmark, for "Dante," says Lowell, "was a mystic, with a very practical turn of mind; a Platonist by nature, an Aristotelian by training."

THE LIBERAL ARTS, ACCORDING TO DANTE.

Liberal Arts.

Trivium	Grammar	Moon	Angels.
	Dialectic	Mercury	Archangels.
	Rhetoric	Venus	Thrones.
Quadrivium	Arithmetic	Sun	Dominions.
	Music	Mars	Virtues.
	Geometry	Jupiter	Principalities.
	Astrology	Saturn	Powers.

Philosophy.

Physics and metaphysics	Starry heaven	Cherubim.
Moral science	Crystalline heaven	Seraphim.
Theology	Empyrean	God.

To the modern student the liberal arts of the early Christian centuries and of the Middle Ages present a very restricted domain, especially when compared with the modern encyclopædia of knowledge or with the needs of civilized society. The enlargement of the idea of liberality, the foundation of modern progress, was closely associated with the organization of universities. It may not be easy to determine which was the cause or which was the effect. Did the universities evoke freedom, or did liberal thought create universities? There was action and reaction. A great step forward was taken when medicine, law, and theology found a place by the side of philosophy, as subjects of the highest educational value. Thenceforward they have been exclusively considered as the liberal or learned professions, until recently. In the nineteenth century the liberal arts include scores of subjects which during previous ages had not entered the minds of men, except perhaps in the most rudimentary form, and liberal professions are no longer limited to the primitive three.

The Immediate Precursors of Modern Universities.—While in general terms the origin of modern universities is dated from Salerno, Bologna, and Paris, in the twelfth and thirteenth centuries, yet the beginnings of these and kindred institutions are lost in the obscure past. We may assume that there has never been a period in the history of civilization without arrangements for the advancement and dissemination of knowledge, corresponding with what in modern times is called the university. Babylon, Heliopolis, Athens, Alexandria, each must have been a seat of higher learning. Nor were they alone. So in Western and Southern Europe, certainly from the time of Charlemagne, there were schools of more or less dignity in courts, cathedrals, monasteries. For example, in France, at the beginning of the twelfth century, three religious schools were famous, those of Paris, Laon, and Chartres. William of Champeaux opened a school of logic in Paris in 1109, and was followed by his brilliant pupil Abelard (1079–1142), *cui soli patuit scibile quidquid erat*, whose lectures were heard by throngs of hearers. Laon won its distinction under Anselm, the "Doctor of Doctors," and his brother Ralph. The school at Chartres became famous at an earlier period under Fulbert, a pupil of Gerbert. Its fame was still greater under the lead of Bernard Sylvester, of whose methods of instruction an account is handed down by John of Salisbury. (Consult Poole's *Illustrations of Mediæval Thought*, where abundant references are given to original sources of information.) As to the subjects studied in these schools of the Church, we have very good records which have been well arranged and condensed in the work of Mullinger on the University of Cambridge. An abstract of his statements will here be given.

Under Gregory the Great (590–604) the Church rested on the authority of the three fathers, Ambrose, Jerome, and Augustine. From the first, she derived her conception of sacerdotal authority; from the second, her attachment to monasticism; from the third, her dogmatic theology. In Augustine, and especially in his work entitled *De Civitate Dei*, may be found the key to the belief and practice of the Church in the Middle Ages. In face of the destruction of Rome, he proclaimed the dominion of a new city, the New Jerusalem. A sublime theocracy was to supersede the rule of the Cæsars. Under Charlemagne (742–814), in the circle where Alcuin taught the mysteries of logic and grammar, there is evidence of a spirit very different from that of Gregory, and in advance of the ecclesiastical ideas of the time. For example, steps were taken for the collection and revision of manuscripts. But these higher aspirations soon ceased. Only here and there the lamp of learning shone with no uncertain light—for example, at Ferrières, where Lupus was bishop. As the twelfth century approached instruction was almost entirely founded on the writings of Martianus Capella and Boethius (non-Christian writers) and of Orosius, Cassiodorus, and Isidorus (Christian writers), all of them compilers from Greek and Roman authors. Other books were read, but these works were the usual school-books. The histories of Orosius (about 416), a kind of abstract of the *De Civitate*, formed a somber treatise, full of wars, plagues, famines, and other tokens of the wrath of God. Through the allegorical treatise of Martianus Capella, *De nuptiis Philologiæ et Mercurii, et de septem Artibus liberalibus*, the modern universities inherited their notions of the trivium and quadrivium. To this far from contemptible curriculum we must be careful not to attach our modern conceptions. To Boethius (475–524) is due the transmission of that element of purely Greek thought which was during seven centuries nearly the sole remaining tradition of the Aristotelian philosophy, although the Aristotle of Western Europe, from the sixth to the thirteenth century, was simply Aristotle the logician. Of Cassiodorus (468–568) there was a meager manual of education, *De Artibus liberalium literarum*. The *Origines* of Isidorus (d. 636) constitute a kind of encyclopædia, a laborious collection of such fragments of knowledge as were still discoverable.

Two conclusions are based upon this study: that the literature from the seventh century to the tenth was scanty in the extreme, and what learning existed was almost exclusively possessed by the clergy.

Those who wish to prosecute the inquiry further will be aided by a reference to the writings of Gerbert, better known as Pope Sylvester II. (about 991), printed (1867) in a critical edition edited by Olleris. A list of the authors upon whom he commented in his school at Rheims, before he was chosen to the holy see, has been preserved by his pupil Richerus, and it indicates instruction remarkable in thoroughness and extent.

Certainly, from Abelard to Aquinas, Aristotle ruled the university world—not the original Aristotle, but his lineal descendant, bearing his name and exhibiting his characteristics, often modified and attenuated, yet not so altered as

to lose the original qualities. A couplet of Godfredus de S. Victor, quoted by Denifle, illustrates the reverence for the writings of the Stagyrite in the mediæval universities:

> Omnis hinc excluditur, omnis est abiectus
> Qui non Aristotelis venit armis tectus.

It is not uncommon to hear the studies of the Schoolmen spoken of with contempt, but it should never be forgotten that their aim was to establish correct habits of reasoning. By the precepts and example of Aristotle, logic was taught. This logic was often employed upon questions rightly called trivial. Time was wasted upon fruitless inquiries. But as years rolled on and new generations arose, the Aristotelian habit, directed to new themes, emancipated the mind and led the way to the modern advancement of knowledge.

Although the data are vague, precedence in the list of modern universities is generally accorded to Salerno, where medicine was taught at a very early period. In the ninth century Salerno was spoken of as *Civitas Hippocratica*; to the eleventh century a poem is attributed, which bears the title *Flos Medicinæ Scholæ Salerni*; and there are statutes regulating the school which belong to the year 1231. During the next quarter of a century there are many evidences of the importance of the school. In the face of political changes, Salerno continued to be a seat of medical science until the time of Napoleon's interference. The influence exerted by the Saracens upon the school of Salerno, "their legitimate offspring," as Gibbon calls it, would be a most interesting line of research.

The Universities of Bologna and Paris.—Respecting the early days of the Universities of Bologna and Paris, the antiquaries have brought together so many curious particulars that it is difficult to separate the important from the secondary. It is easy, however, to see that usages, regulations, titles, phrases still in academic vogue, even in the new world, go back to the beginnings of these institutions. Indeed it is hardly possible to understand the unwritten laws by which modern universities are governed without reference to their historic basis. Nevertheless the main utility of such investigations is found in a revelation of the long and wearisome steps by which the human race has been advancing in its searches after truth. It has taken fully seven centuries for the most civilized nations of mankind to establish the proper relations of literature and science to a liberal education, and the most efficient methods of promoting learning. At certain periods the universities have even seemed to hinder the advancement of knowledge and the appreciation of literature; nevertheless, as a general rule, their influence, direct and indirect, has perpetuated the study of the great writers of antiquity and the great leaders of human thought; their influence also, especially during the last century, has favored the employment of scientific methods.

The exact date when the university was organized in Bologna is of little importance compared with the fact that the Roman law was there introduced as a subject of study by a teacher who had the power of attracting and inspiring large companies of students. The influence of Irnerius (d. 1118) was soon and strongly felt far beyond Italy. All historians of this period recognize the fact that the emancipation of the human mind, and also the development of the modern state, were largely due to this revival of interest in the *Corpus Juris Civilis*. For example, James Bryce says, "It can not be doubted that, in Germany and in England, a body of customary Teutonic law would have grown up had it not been for the notion that since the German monarch was the legitimate successor of Justinian, the *corpus juris* must be binding on all his subjects."

Paris shares with Bologna the honors of priority. As Bologna was renowned for the study of law, Paris was distinguished for its attention to theology and the liberal arts, while the student of medicine resorted to Salerno and a little later to Montpellier. There was a saying, "Italy has the pope, Germany the emperor, France the university." The usages and example of Paris were followed in England and in Germany, and indirectly at least in other countries.

The publications of Father Denifle reveal the condition of affairs in the University of Paris during the thirteenth century in minute details. It is amusing to read the original papers thus brought together, and observe how exactly human nature then corresponds with human nature now. There are the same jealousies, ambitions, difficulties, strifes, and victories. If a writer with the skill of Froude would do for this mass of documents what he has done for the correspondence of Erasmus, a volume of even greater interest might be forthcoming. Meanwhile, as much of this material is unknown to the general reader, a few illustrations will here be given, for it is certain that but few will have the patience to go through this great repository. Those who wish for a briefer story will find an excellent article, by Rev. H. Rashdall, in the *English Historical Review* for 1886, the conclusions of which were reached by independent studies.

Thus, for example, there are questions of prerogative or jurisdiction between the chancellor or external authority, representative of the Church, and the rector or intramural representative of the teaching body. The faculty of theology dispute the power of the rector. In the faculty of medicine there is a quarrel about the election of deans and examiners. There are the rudiments of a "curriculum," prescribing what books may be read and what may not be read, particularly on holy days. We have indications of trouble between gown and town, the students and the night-watchmen. Academic degrees and titles are abused, and must be protected. Especially, unauthorized persons must not practice medicine. Surgeons and apothecaries must keep to their own special departments. Expulsion from the university is a penalty for continued neglect of studies. Masters of arts must not dictate their lectures. Fees are to be made proportionate to the time of residence. Students must be punctual at their meals, and may be punished for misconduct. Presents to the chancellor, on receipt of a license from him, are not allowed. Steps are taken by the university to control the sale of books. Heresy must be stamped out by vigorous measures. Certain teachers who hold to the doctrine of the Trinity in an unacceptable form are burned at the stake—*a seculo migraverunt* is their euphonious epitaph. These citations are taken here and there from papers that are dated between the middle of the thirteenth and the middle of the fourteenth centuries. Only one more extract will be given, and this will show that academic boasting is not the invention of the nineteenth century. A paper that belongs to the end of the fourteenth century, attributed to Gerson, but, according to Denifle, more probably the work of another, begins with this laudation of the University of Paris:

"Just as the University of Paris is prior in origin, so, too, in glory and dignity it has always surpassed all others. Some derive it from Rome, others from Athens, others from Egypt. Some even trace it to the prophets, while others find its origin in paradise, either that earthly paradise where the knowledge of things divine and things human is said to have been infused into Adam, or that heavenly paradise, where, if we are to believe the poets, Minerva, goddess of wisdom, sprung from the head of Jove. The Wise One himself, as if in agreement with them, has asserted that 'Wisdom was sent down from heaven' (Wisdom, ix., 10), and elsewhere (Eccles. xxiv. 5) that it 'proceeded out of the mouth of the Most High,' and 'was an image of his goodness' (Wisdom, vii., 26). Without, however, continuing this discussion we know this for certain, that the other seats of learning derived their origin from Paris, it being as it were a living fountain, which, dividing into four faculties like so many rivers, irrigates the whole surface of the earth with the waters of learning. I know, indeed, that other schools contribute in no small degree to the store of learning, and that they are by no means without reputation, each one being strong in its particular branches; but ours embraces all in its more ample bosom, so that there are some who think that it was from this fact that the Parisian school got the distinctive name of 'university,' because it has accumulated within itself the particular prerogatives and branches of learning of the individual schools. In philosophy, metaphysics, and theology it surpasses all others, even as in brilliancy the sun surpasses the moon. To use the words of Maro, it is a British whale among dolphins." The quotation, however, is not from Vergil, but from the tenth satire of Juvenal, v., 14.

The Universities of Paris and Bologna were the gradual evolution of the times. Not the Church nor the state, but students following the lectures of masters made the first universities. The associations or societies of students at Bologna, called *universitates*, more than four of them at one time, were in fact akin to guilds of craftsmen, combinations of those whose pursuits were similar, for mutual protection and advantage. Like confederations arose in other seats of learning, as at Vercelli and Padua. So in Paris (probably after the example of Bologna) four "nations" were constituted, including both teachers and pupils—namely, the French, Picard, Norman, and English "nations,"

each of these terms having a very broad territorial significance. These constituted the faculty of arts. Presently the faculties of medicine, canon law, and theology were grouped around the faculty of arts, which was in a certain sense tributary to the three other faculties.

With respect to the inner life of the university, Mullinger has pointed out the differences between Bologna and Paris. In the former, instruction was entirely professional, designed to prepare the student for a definite and practical career in after life; in the latter, it was sought to provide a general mental training, and to attract the learner to studies which were speculative rather than practical. In the sequel, the less mercenary spirit in which Paris cultivated knowledge added immensely to her influence and reputation.

The Rapid Spread of Universities in the Thirteenth and Fourteenth Centuries.—It is now time to consider the spread of universities. When their importance was perceived, pope and emperor, cities and sovereigns, rivaled one another in efforts to establish seats of learning. Consequently, including Bologna and Paris, fifty-five high schools were initiated prior to 1400, some of them destined indeed to premature death, but most of them surviving at the end of the century. A group of a dozen schools (Macerata, Lyons, Brescia, Messina, Palermo, Vienne, Palma, Rheims, Todi, Pistoja, Mantua, and Parma) may be passed by as wrongly called universities. Nine grew into universities by usage and privileges—namely, Salerno, Oxford, Orleans, Angers, Padua, Vercelli, Reggio, Modena, Vicenza. Sixteen establishments were based upon papal charters—that of the papal court, Rome, Pisa, Ferrara, Toulouse, Montpellier, Avignon, Cahors, Grenoble, Cambridge, Valladolid, Heidelberg, Cologne, Erfurt, Fünfkirchen, and Buda. A group of ten institutions received imperial or other civil charters—Arezzo, Sienna, Naples, Treviso, Orange, Palencia, Salamanea, Seville, Lérida, Huesca. The fourth group, nine in number, received both papal and civil authority—Perpignan, Lisbon, Perugia, Florence, Piacenza, Pavia, Prague, Vienna, Cracow. Finally, nine projected universities did not come into being—Fermo, Verona, Orvieto, Pamiers, Dublin, Valencia, Alcalá, Geneva, and Lucca. Such an exhibit justifies the statement that the thirteenth and fourteenth centuries are the epoch of university foundations.

The Rise of the German Universities.—If Germany was not the original seat of the modern university, it has certainly been its most congenial home. Paulsen has arranged by periods the names of those institutions in which the German language is employed for instruction, thus including the Austrian universities and some of the Swiss. The first period is prior to the invention of printing; the second prior to the Reformation; the third is the period of religious wars, when denominational universities dependent on the state and Church came into being—Marburg, Königsberg, Jena, Giessen, etc., on the Protestant side, and Würzburg, Gratz, Innsbruck, etc., on the Catholic side. The fourth period, covering the last two centuries, is naturally divided into an earlier epoch (that of Halle, Göttingen, Erlangen, etc.), and a later, which has seen the ascendency of Berlin, Bonn, Munich, and the rejuvenated Strassburg.

In the following table, taken from Paulsen, the figures indicate the date of foundation, and in certain cases the date of suppression, or of transference to a new site:

First Period.

Prague (Austrian), 1348.
Vienna (Austrian), 1365.
Heidelberg, 1385.
Cologne, 1388–1794.
Erfurt, 1392–1816.
Leipzig, 1409.
Rostock, 1419.

Second Period.

Greifswald, 1456.
Freiburg (Baden), 1457.
Basel (Swiss), 1460.
Ingoldstadt, 1472–1802.
Treves, 1473–1798.
Mentz, 1477–1798.
Tübingen, 1477.
Wittenberg, 1502–1817; transferred to Halle.
Frankfort-on-the-Oder, 1506–1811; transferred to Breslau.
Herborn, 1654; converted into a theological seminary, 1818.
Duisburg, 1655–1818.
Kiel, 1665.
Innsbruck (Austrian), 1672.

Fourth Period.

Halle, 1694.
Breslau, 1702; re-organized, 1811.
Göttingen, 1737.
Erlangen, 1743.
Münster, 1780.
Berlin, 1809.
Bonn, 1818.
Munich, 1826.
Zurich (Swiss), 1832.
Berne (Swiss), 1834.
Czernowitz (Austrian), 1875.
Freiburg (Swiss), 1889 (lectures partly in German, partly in French).

Third Period.

Marburg, 1527.
Königsberg, 1544.
Dillingen, 1549–1803.
Jena, 1558.
Braunsberg, 1568; reorganized, 1818.
Helmstädt, 1576–1809.
Olmütz (Austrian), 1581–1855; now a theological faculty.
Würzburg, 1582.
Gratz (Austrian), 1585.
Giessen, 1607.
Paderborn, 1615–1818.
Strassburg, 1621; newly founded, 1872.
Rinteln, 1621–1809.
Altdorf, 1622–1807.
Salzburg (Austrian), 1623–1810.
Osnabrück, 1630–1633.
Bamberg, 1648–1803.

Spread of Universities through Europe, etc.—The University of Oxford was modeled upon that of Paris. Like that of its antecedent, its origin is obscure, and its early years show the influence of many subtle forces rather than the impulse of the crown or the Church. Certain monastic schools, St. Frideswyde and Oseney, are supposed to have been the nucleus of the university. Vacarius, a follower of Irnerius, brought from Bologna to Oxford the knowledge of the Roman law, and previously (1133) Robert Pullen had arrived from Paris and lectured upon the Bible. In the twelfth century Giraldus Cambrensis describes Oxford as a place where "the clergy in England chiefly flourished and excelled in clerkly lore." Early in the thirteenth century large numbers of students migrated from Paris to Oxford and Cambridge. In the year 1257 the Oxford authorities speak of theirs as a school second only to Paris. The earliest colleges were University (1249), Baliol (1263), and Merton (1264).

The University of Cambridge is a little younger than that of Oxford. In the twelfth century there were probably schools connected with the Church of St. Giles. In 1224 the Franciscans came, and half a century later the Dominicans. In 1231 and 1233 there are indications that the university is an organized body with a chancellor at its head, and in 1318 a formal recognition of the place as a *studium generale* is received from the pope. The earliest colleges are Peterhouse (1286), Michaelhouse and King's Hall (1326), Pembroke (1347), Gonville (1348), Trinity Hall (1350), Corpus Christi (1352).

The modern universities in England are Durham (1657; revived in 1831), London (1825; reorganized in 1836), and Victoria (chartered in 1880).

There are four universities in Scotland—St. Andrews (1411), Glasgow (1453), Aberdeen (1494), Edinburgh (1582).

In Ireland the leading university is that of Dublin, commonly known as Trinity College, Dublin, founded in 1591. The Royal University (1880), which is chiefly an examining body akin to the University of London, comprises also the Queen's colleges of Belfast, Cork, and Galway, which were formerly associated in the Queen's University. The Catholic University (1854) is in Dublin, and St. Patrick's College at Maynooth was founded in 1795 for the education of priests.

Where British colonization and conquest have gone—in Canada, Australia, New Zealand, India—universities of the English type have been established. Among the higher institutions in Canada the most important are the University of Toronto (1828), the McGill University in Montreal (1821), Laval University in Quebec (1852), Dalhousie University in Halifax (1820), and Queen's University in Kingston (1841). In Australia there are the Universities of Adelaide, Sydney, and Melbourne. New Zealand has its university. India has five institutions for superior instruction under English auspices. The University of Tokio in Japan, an establishment of great promise, is based upon the observation of German, English, and American experience.

In France, the antiquity of Montpellier comes next to Paris. Its six hundredth anniversary was celebrated in 1890. As far back as 1181 medical instruction was there given, and a faculty of jurisprudence was instituted before the close of the twelfth century. Pope Nicholas IV. gave Montpellier a charter in 1289. Toulouse in 1233 received a charter recognizing it as a *studium generale*, and Orleans not far from the same time. As already stated, the universities of Angers, Avignon, Cahors, Grenoble, Perpignan, and Orange (the two last named having but a nominal existence) were established before the end of the thirteenth century. In the course of the Revolution (1793) the ancient universities of France were suppressed, together with the professional faculties. In their place, when Napoleon assumed the rule of centralization, the University of France was instituted by a decree of Mar. 17, 1808, as a central

authority, which should control nearly all the higher institutions of learning in the country. "Academies" took the place of "universities." The Collège de France, founded in 1530 (spared by the Convention and restored in 1831), the École Polytechnique (begun in 1794), and the École Pratique des Hautes Études (instituted in 1868), with other foundations, supplement the faculties in Paris, and amid many political changes, have maintained their autonomy and their distinctive characteristics. The name of one of the oldest colleges in the University of Paris, the Sorbonne, has been perpetuated since its foundation in 1250 until the present time, and the magnificent buildings recently constructed in Paris as a home for the liberal arts bear the name of the New Sorbonne.

For many years past a movement has been in progress tending toward the revival of the ancient foundations, or, in other words, for the transformation of the existing "faculties" into universities. In 1875 a law was passed relative to the liberty of superior instruction, and in accordance therewith the Roman Catholics began university work at Paris, Lille, and Angers. This law made provision for future legislation in the interest of still greater reforms. Such legislation was actually proposed in 1890 by M. Bourgeois, then Minister of Public Instruction. In the meanwhile the Government had been actively engaged in the improvement of the buildings and apparatus devoted to higher education in different cities. The New Sorbonne illustrates this activity. So in other seats of learning, where, until recently, only lecture-halls were found, laboratories for instruction and research, cabinets, libraries, studies, and conference-halls have been provided by liberal expenditures. The provisions for retaining governmental supervision while certain powers are transferred to the local universities proved to be a difficult problem. The number of students has rapidly increased as better opportunities have been offered them. See a paper on *Education in France*, by A. T. Smith, in *Report of United States Commissioner of Education* for 1891–92.

The other states of Northern Europe—Russia, Sweden, Norway, Denmark, Holland, Belgium, and Switzerland—maintain their universities very much in accordance with German models. In the south of Europe, Spain followed Italy in the early establishment of universities, among which, for nearly five centuries, from the thirteenth to the eighteenth, Salamanca was the most distinguished. Madrid is now frequented by a large number of students. Coimbra, in Portugal, is flourishing. In recent years the universities of Italy—sixteen of them pertaining to the state, and four being free from governmental control—have shown new life. In Greece the University of Athens (1837) has acquired distinction.

Attendance upon European Universities.—The list of universities given in *Minerva* for 1894–95 includes 129 names, besides the 16 faculties of France, 63 colleges or academic institutions of a high rank, and 7 examining bodies more or less akin to the University of London. Of those enrolled as universities, 64 have an attendance of more than 1,000 students each, and 48 others are attended by more than 500 students each. The largest numbers are found in Paris, 10,643; Berlin, 8,343 (of whom 4,735 are "hearers"); Madrid, 5,867 (of whom 2,906 are "hearers"); Vienna, 4,856 (of whom 3,913 are "hearers"); Naples, 4,822 (of whom 4,732 are "hearers"). The number attributed to Oxford is 3,222, and to Cambridge 3,156.

Universities in the U. S.—Higher education in the U. S. was at first promoted by simple colleges. Harvard, Yale, and William and Mary were based upon the conception of the college as it existed within the universities of Oxford and Cambridge in the early part of the seventeenth century. Columbia, Princeton, Rutgers, Brown, Williams, Bowdoin, Union, and scores of other institutions were formed substantially upon the model of Harvard and Yale. At the beginning of the nineteenth century broader ideas prevailed. Professional schools of law, medicine, and theology were grafted upon the original stock, or were founded in close proximity to existing colleges. In the middle of the nineteenth century schools of science (Lawrence, Sheffield, Chandler, etc.) were inaugurated. Still the name "university" was very cautiously employed.

The organization of the University of Virginia, in 1826, brought new methods forward. Thomas Jefferson was familiar with the continental ideas of universities, and he introduced many of their features, which were quite distinct from those of the English colleges. With the opening of the Northwest separate States were persuaded to give their name and their funds to the foundation of universities; and at a still later period the so-called agricultural college grant gave to scientific education all over the land a new impulse.

Thus it may be seen that the universities of the U. S. may be arranged in four groups: First, those which are the outgrowth of the early colleges, like Harvard, Yale, Columbia, etc.; second, those which have been founded by some of the separate States of the Union, like Michigan, Wisconsin, Minnesota, California, Virginia, South Carolina, Georgia, etc.; third, private foundations, like Cornell, Johns Hopkins, Leland Stanford, Tulane; and fourth, ecclesiastical universities, as in Chicago, Washington, Evanston, Sewanee, etc. Although the administration of these institutions may appear to differ widely, yet within the walls, the courses of instruction, the methods of discipline, and the terms of promotion will be found quite similar. The differences that exist are due rather to differences of income than to differences of aims. The hope is sometimes expressed that the attempt will be made to give emphasis in each strong institution to particular branches of learning, philology, natural science, mathematics, etc., but no such tendency is yet manifest. Each institution, so far as its means will permit, endeavors to cover just as wide a range as possible.

Four distinct periods are also to be noticed in the development of universities in the U. S. In colonial days, until the Revolution, the English college was the simple form by which higher education was promoted. Next came a period early in the nineteenth century, when professional schools of medicine, law, and theology were instituted—sometimes in close connection with the older colleges, and often quite independently. A third period began in the middle of the nineteenth century, when scientific schools and technological institutes were devoted to the advancement of pure and applied science. In the fourth period opportunities of study and for investigation and for publication have been given far beyond those ever offered in previous days.

In the city of Washington, at the present moment, we may see the different forces of society at work upon the university problem. Since the early part of the nineteenth century the national capital has been the seat of the Columbian University, a private corporation, which has been largely controlled by one religious denomination. It includes schools of law, medicine, science, and the liberal arts. For reasons which need not here be discussed it has not acquired that distinction among universities of the U. S. which might have been expected from its relations to the seat of government. Consequently, the demand has sprung up for a national university, to be established in Washington and endowed by the Government. Able men have worked together in the advocacy of this idea. Bills have been repeatedly introduced in the Congress, and have passed through one or more of the requisite stages of legislation, but final action has not been taken. While this discussion has been in progress, the Roman Catholics have begun a university at the capital, having secured for it a large tract of land, upon which commodious halls have been constructed. Faculties of theology and philosophy have been organized, students assembled, and publications of a scientific character have appeared. It is a remarkable fact that the authority of this foundation proceeds from the see of Rome, being embodied in a papal decree issued by Leo XIII. Closely coincident with the action of the Roman Catholics is that of the Methodists. Under the auspices of leading members of this denomination, a charter has been secured, land acquired, and plans matured for the American University. Thus we have in Washington a Roman Catholic, a Methodist, and a Baptist university, with the possibility that a national university will be added to the number.

Existing Forms of European Universities.—The existing forms of university organization in Europe may be arranged in these groups:

1. The most common is the German type, which has these characteristics: The authority, the ultimate direction, rests with the government of each state. Students are presumed to have received a good preliminary training in the gymnasium, or in some corresponding institution. The philosophical faculty usually includes the chairs devoted to language, literature, history, philosophy, mathematics, physical and natural sciences. Sometimes there is a division, as, for example, in Munich, where the political sciences are attributed to a separate faculty, and the philosophical faculty is divided into two sections: (*a*) philosophy, philology, and history; (*b*) mathematics and natural sciences.

Many students pursue for a time a course of philosophical studies, though their chief interests are elsewhere. Three other faculties are grouped around the philosophical—namely, law, medicine, and theology. Laboratories and institutes for special subjects are growing up under the university control. Technical schools are for the most part regarded as without the pale. This type prevails in Germany, Austria, Holland, Belgium, Scandinavia, Russia, and Switzerland. The prevalence of this form of organization induced the remark of a distinguished German professor, that there is not as yet in the U. S. a single university in the sense attached to the word by Europeans.

2. The French type was established under Napoleon by the decree of Mar. 17, 1808. The ancient universities had been suppressed. In their place nearly all institutions of learning, from the lowest to the highest, were constituted the University of France. The ministry of Public Instruction, aided by a council, controls everything. This council includes five directors of (*a*) superior, (*b*) secondary, and (*c*) primary education; (*d*) of the office of secretary and comptroller; and (*e*) of the fine arts. The educational system of France is divided into academies. At the head of each is a rector, named by the minister, who directs in his domain the three grades of instruction—primary, secondary, and superior. A vigorous movement is in progress to restore to the ancient universities—Montpellier, Lyons, etc.—their former prerogatives and prestige. The law of 1880 (Feb. 27) so far reorganized the university councils that the inner forces, the teaching forces, have now a greater share in the government. By this law the Conseil Supérieur has become the representative of the intellectual and scientific interests of the country.

The nearest approach to the French idea in the U. S. is the University of the State of New York, the regents of which exercise a limited control over all universities, colleges, academies, and schools which are organized by the laws or charters of the State.

3. The two great English universities, Oxford and Cambridge, have preserved more of the ancient forms. They are groups of colleges, associated in a university, each retaining independence in the holding of property and in the training of youth. Above the colleges are the authorities of the university by whom degrees are conferred, professors appointed, and regulations of general importance prescribed and enforced. By various boards and syndicates the teachers of kindred subjects are brought into close co-operation with one another, and by their college enrollment the students are divided into distinct companies and subjected to tutorial discipline and instruction. Of recent years the colleges have united in the establishment and maintenance of professorships, the instruction of which may be accessible to all members of the university, and, under certain regulations, to others who are qualified to attend. In 1880 a charter was given to the Victoria University, the official title of a group of colleges, of which Owens College, at Manchester, is the leader.

4. The University of London is unique. It exists as an examining body, having the power to confer academic degrees upon students who have conformed to certain definite requirements. The examinations of this body have been conducted with so much accuracy and skill that diplomas thus secured have a very high value as certificates of proficiency; but they afford little evidence of the possession of such an academic spirit as is usually produced by residence in a well-developed university. Measures are now in progress for the organization of a teaching university in London, and a voluminous report upon the subject has been presented to Parliament.

Dominant Subjects of Study.—Far more interesting than a statistical, chronological, or territorial account of universities is the story of the subjects that have successively come into prominence, especially in the faculty of philosophy or the liberal arts. We have seen how, at Salerno and Montpellier, medical science was fostered, at Bologna the study of law, and at Paris theology and scholastic philosophy. The intense enthusiasm exhibited by the Schoolmen never reached a higher point than it did in the lecture-rooms of Abélard (1079–1142), but for two centuries afterward the discussions of the Nominalists and the Realists were vigorous and absorbing. It is hard to appreciate the importance attached to the distinctions of these acute dialecticians, except by bearing in mind that philosophy and theology were closely interlocked (as they are still), and that the doctrine of the real presence of Christ in the Eucharist turned largely upon the meaning of the word *real* and the nature of abstract existences. "Are abstract terms words only, or are there physical beings corresponding to every abstract term?" Aristotle was at the bottom of all this dialectic. The *Sentences* of Peter Lombard (d. 1164) applied the principles of the Stagyrite to Christian doctrines, and remained for a long period the manual of theological students. In St. Thomas Aquinas, "the angelic doctor" (1227–74), mediæval philosophy bore its richest fruit. He was unwearied, says a recent Roman Catholic writer, in laying stress upon the fundamental principle that between the truths of reason and the truths of revelation, when rightly understood, there is neither divergence nor discord. It is for this reason that he still retains his ascendency. His writings, republished by the Vatican in a sumptuous edition, are commended by Leo XIII., in the encyclical *Æterni Patris* of 1879, to renewed and earnest study. "Greatly enriched as he was with the science of God and the science of man, he is likened to the sun, for he warmed the whole earth with the fire of his holiness and filled the whole earth with the splendor of his teaching." (Cf. *Aristotle*, etc., by Brother Azarias.) A Protestant historian (Flint, *Phil. Hist.*) emphasizes the fact that St. Thomas recognized "progress to be a universal law of things, and all knowledge to be progressive." This comes very near to the modern law of continuity, and the more recent doctrines of evolution. Whatever repugnance to the scholastic philosophy may be felt, no mistake will be made if we remember what has already been said, that to its indirect influence may be attributed the ascendency of reason above authority which has characterized the modern era, and of which the end is not yet.

Roger Bacon (1214–92) was one of the most able of educational reformers. He advocated a study of Greek, Hebrew, and Arabic, but to mathematics, divine mathesis, he gave the highest place. It was long indeed before such views were prevalent. The mathematics of his time were rudimentary indeed. Geometry held its place, but we are told that the student seldom crossed the *pons asinorum*. In the early days of the Universities of Prague, Vienna, and Leipzig, as well as in Paris, provision was made for the study of mathemathics, but not until the discoveries of Newton and Leibnitz was there an adequate recognition of the value or even of the significance of mathematical thought, and it was not until the nineteenth century that the dignity and possibilities of this science were discovered.

The revival of letters in the last half of the fifteenth century quickly made its influence felt in the universities. The migration of Eastern scholars to the West, consequent upon the capture of Constantinople by the Turks (1453), was of great significance, for they brought to Italy knowledge and appreciation of Greek letters. The invention of printing (about 1454) and the production by the Aldi (1490–1597) and other enlightened printers of the great works of antiquity were likewise events the potency of which can not be estimated. A century earlier Petrarch (1304–74) had given an impulse to the study of classical literature, especially Latin, and the collection of manuscripts by Guarino, Filelfo, Aurispa, and Poggio established the reign of the humanities. Classical learning was ascendant. There was "a resurrection," as Symonds has said, "of the mightiest spirits of the past." It took a long while for Greek literature to win its place. The annals of Cambridge show what hostility the new education encountered. Latin was the tongue of the Church, of the received Scriptures, of current theology and philosophy. It was a sanctified language—but Greek! That was the language of heresy. Reuchlin, at Basel, brought forward the Greek text of Aristotle, and was vehemently assailed by the seniors of the university, who declared that to give instruction in the opinions of schismatic Greeks was contrary to the faith and an idea only to be scouted (Mullinger). Oxford was more hostile than Cambridge to Greek, a circumstance which led Erasmus to begin his career as a teacher of Greek in England in Cambridge. Slowly but surely the battle was won, and Greek and Latin letters have ever since had their place in every university. Their effects are seen in all departments of modern literature.

The exact observation of natural phenomena and the performance of physical experiments, chief factors in the advancement of modern science, have only recently found a place in the domain of university instruction. But now they receive almost everywhere abundant encouragement. Let the programme of any flourishing university of this day be compared with that of the most expanded university 100 years ago, and the change will seem marvelous. A great

advance was made when Liebig, at Giessen, introduced the laboratory as an agent in university instruction. The methods of instruction and research first employed in chemistry have been carried into other sciences—physics, anatomy, physiology, pathology, botany, zoölogy, geology, mineralogy. The example of the laboratory methods has even been felt in literary, philological, and historical studies, where the critical scrutiny of original authorities is generally encouraged, in "seminaries." The comparative method of investigation has been fruitful. Indeed the historian Freeman has said that "the discovery of the comparative method in philology, in mythology—let me add, in politics and history and the whole range of human thought—marks a stage in the progress of the human mind at least as great and memorable as the revival of Greek and Latin learning." To Bopp is due the honor of initiating the study of comparative grammar, and to Stein and Ranke the encouragement of *Quellenforschung*, an investigation of the sources of historical literature.

The Functions of a University.—It may now be well to enumerate some of the principal functions of a university at the end of the nineteenth century. In the first place, it adheres to its original task of instruction. Youth, fitted by previous studies to follow the highest attainments of human thought, are encouraged to do so by teachers who have won distinction in the various branches of knowledge which they profess. It is by this quality that universities are distinguished from academies and learned societies, which are associations of scholars for their mutual benefit and for the promotion of knowledge, but without any reference to the training of youth. Universities are also distinguished from colleges, the object of which is to provide a preparation for life or to lay foundations for the subsequent study of law, medicine, theology, and innumerable modern vocations, including those of the teacher and investigator.

2. It is the duty of universities to perpetuate all the best achievements of mankind in former ages, to provide for the study of the languages, literature, religions, laws, philosophies, customs of antiquity, so that nothing that the human race has achieved may be lost sight of. Everything that illustrates the experiences of our race or its endeavors to establish good social conditions and to promote the highest intellectual and moral progress should be taught in a university. Especially in these days should the study of comparative religion and comparative politics be encouraged, the sources from which have sprung the modern ideas of government and religion. Literatures remote from those of modern Europe, by their antiquity or by their appearance in Oriental countries, are not to be neglected.

3. It is another function of universities to extend the borders of knowledge, especially to investigate, with the newer methods of research, and with the co-operation of scholars in every part of the world, the phenomena of nature. Such researches begin with an extension of the field of mathematics. Astronomy, physics, dynamics, logic, follow closely. Chemistry stands next. The functions of living organisms in health and disease, animal and vegetable, open wide domains. The structure of the earth and the processes by which it has been brought into its present form are another field of observation. The laws of climate are closely connected with those of geology. Then there is the wide range of economic and financial laws and the study of those subtle processes by which social institutions have been organized and established.

4. For the prosecution of such work universities must form large collections of books, works of art, coins, specimens in natural history, maps, scientific apparatus, and instruments of precision. It is not essential that such collections should belong to the corporate body known as the university, but every company of scholars must have the easiest possible access to literary and scientific collections, to laboratories, observatories, museums, cabinets, and libraries.

5. It is an important function of universities to bestow, upon suitable evidence, certificates, academic titles, and licenses, both in the liberal arts and in the various departments of professional activity. It is quite time that in the U. S. there should be a rehabilitation of degrees. They have been brought into ridicule partly by multiplying such distinctions and partly by bestowing them unworthily. In Europe academic diplomas convey many rights and privileges of an important social character. They are guarded both by law and by public opinion. In the U. S. degrees are awarded with unfortunate freedom by any institution which bears the chartered name of a college. It may be as difficult to limit this power as to limit the suffrage, but every step taken in that direction is to be commended.

6. It is the business of universities to disseminate as widely as possible by means of publications, perhaps also by popular lectures, the knowledge of which its members are the possessors and guardians. There is danger that college publications will be regarded as advertisements of the institution from which they proceed, and not as the means of conveying to the highest scientific and literary courts of the world, the results of original work. Nevertheless the principle holds good that the members of a university are bound to bring before the public the results of their study.

7. Another function of the university is to discover and encourage unusual talent, not merely by offering to needy students of merit financial support, but by recognizing and encouraging the rare abilities which appear alike among the poor and among the rich.

8. From what has been said it is apparent that universities should uphold the highest standards of professional learning, in law, medicine, theology, in education, in investigation, and in scientific service.

9. In the future development of American universities, the possibility and desirability of co-operation and federation should be considered. In every large city the forces which are working together for the promotion of culture should, by some process or another, be brought into a state not of passive friendliness, but of active co-operation. James Bryce explains the structure of the American Federation by a reference to the federal system as it long existed in the Universities of Oxford and Cambridge. The Universities of Harvard and Yale are largely the federation of separate foundations. Columbia College, in New York, is becoming the central point of many local institutions devoted to medicine, pedagogics, natural history, and the fine arts. In California the State University has its seat at Berkeley, with certain of its departments in San Francisco and the Lick Observatory scores of miles away. In New Orleans, around the foundation made by Tulane, several institutions are grouped. The three great libraries in the city of New York, the Astor, Lenox, and the Tilden, have come under one administration. All these signs are encouraging. They look toward the promotion of independence in special directions, with an obligation to respect and help on what is done in other institutions. Dr. S. S. Laws, in the U. S. Commissioner's *Report* for 1891–92, advocates, as Dr. James McCosh suggested long ago, the federation of the colleges of a State under the leadership of a State university.

Conclusion.—The German authority already quoted, Dr. Paulsen, surveying the field outside of Germany, makes this significant remark: "Thus far the greatest measure of success has perhaps been reached by some of the most prominent American universities in their efforts to carry out the German principle of the union of scientific investigation and scientific teaching." But lest this encouraging word should be too grateful, it may be well to temper it with a warning from another German, Dr. Conrad, who wisely says that "what is wanted in American higher education is not so much quantity as quality. There exist centers at least sufficiently numerous for the teaching of the higher subjects; the teaching given is sufficiently cheap; it is much valued, and affects a large proportion of the population. In these respects America may seem to resemble Germany and Scotland rather than England, where the lower middle and poorer classes remain outside the sphere of university influence. But there are still few among the transatlantic universities—and this applies to Canada no less than to the U. S.—which have an adequate staff of professors, which duly recognize the less popular subjects, which have expanded their old curriculum or evolved new curricula so as to keep pace with the recent development of the sciences, the moral, political, economic, and philological, as well as the natural sciences."

Dr. Stanley Hall, in an article in the *Academy*, 1891–92, expresses the opinion that "the last quarter of this century will be remarkable hereafter as the educational era in the world's history"; and he adds that "universities have become the leading question of our age. Their patronage is the chief glory of the modern state, and their discoveries now kindle the brightest lights upon the Muses' sacred hill."

For further information on the subject of universities, the reader should consult the writings of the four investigators whose statements have been freely quoted in the body of this article—Prof. J. B. Mullinger, of the University of Cambridge, England; Prof. Paulsen, of the University of Berlin;

Prof. Conrad, of the University of Halle; and the Rev. Father Denifle, O. P., who is one of the archivists of the Vatican. They represent respectively English, German, and French university history. In the *Report* of the U. S. Commissioner of Education for 1891–92, translations, by L. R. Klemm, of the papers by Paulsen and Conrad are given.

The modern interest in the origin of universities is due, in no small degree, to the learned historian of the Roman law, Friedrich C. Von Savigny, one of the early professors in the University of Berlin. His first volume was printed in 1815, and the last in 1832. President Woolsey, in *The New Englander*, has given to American readers a careful estimate and abstract of the university chapters. But since Savigny a flood of light has been thrown upon the subject by special volumes devoted to particular foundations—for example, Bologna, Paris, Oxford, Cambridge, Montpellier, Freiburg, Edinburgh, Dublin, Heidelberg, Vienna, Basel, Erfurt, Leipzig, and Louvain.

Perry's translation of Paulsen's study of the *Organization of German Universities*, introduced by N. M. Butler (New York, 1894), supplemented by the English translation, introduced by J. Bryce, of Conrad's *German Universities during the Last Fifty Years* (1889), and compared with the impressions of an English critic, M. Arnold, *Schools and Universities of the Continent* (1868), and of an American observer, J. M. Hart, will give a good impression of the condition and methods of German institutions. For the earliest period, Denifle's *Entstehung d. Univ. des Mittelalters bis 1400* is almost indispensable, but it has not been translated.

The three volumes in quarto, *Cartularium Universitatis Parisiensis* (Paris, 1893–94), edited by Father Denifle, with extended and learned annotations, is an inexhaustible mine of information respecting the origin of the University of Paris, and incidentally of its kindred elsewhere. For the period that it covers it supersedes all other histories of that great foundation in Paris which was known as "the mother of universities." The writings of J. Bass Mullinger not only give the early history of the University of Cambridge, but exhibit the relations of the great English universities to the progress of learning and education on the Continent. To the student of English and American education these discriminating volumes, with a smaller book by the same author on the University of Cambridge in the sixteenth century, will be found instructive. For this period a part of Froude's *Erasmus* is suggestive.

During many years Huber's *English Universities*, translated by F. W. Newman (1843), was a standard. For Oxford, Anthony à Wood's *Athenæ Oxonienses* will always be an important book; see also Lyte's *History of the University to 1530* (1886), Brodrick's *History of the University* (1886), Andrew Lang's *Historical and Descriptive Notes* (1890), A. Clark's *Colleges of Oxford* (1891), *Oxford and Oxford Life*, by J. Wells, and the *City of Oxford*, by Boase. In addition to the works of Mullinger, already cited, which give the history of Cambridge to the accession of Charles I. (2 vols., 1873 and 1884), reference should be made to the *Architectural History of the University of Cambridge*, by Willis and Clark (4 vols., 1886). There are two books by Americans who have studied in Cambridge—*Five Years in an English University*, by C. A. Bristed (1852), and *On the Cam*, by William Everett (1866). The histories of separate colleges in Oxford and Cambridge should also be consulted. Grant's *History of the University of Edinburgh*, prepared for the tercentenary celebration, is admirable.

The lectures of S. S. Laurie on the *Rise of Universities*, Sir William Hamilton's *Discourses*, Wordworth's *Scholæ Academicæ*, Mark Pattison's *Suggestions on Academic Organization*, various essays of Prof. Goldwin Smith, H. Rashdall on the *Universities of the Middle Ages*, Cardinal Newman on the *Idea of the University*, and the voluminous blue books of the British Government, including one on the *Evidence taken by the Gresham Commission* (1894), may be read with profit by those who are concerned in the organization and administration of American universities. For the U. S. the best sources of information are the inaugural speeches of college presidents and the annual reports of colleges and universities, with some special articles to be found in various journals of education edited by H. Barnard, N. Murray Butler, and G. Stanley Hall. Valuable contributions to American educational history are found in the series of monographs edited by Herbert B. Adams and issued by the U. S. bureau of education, each one of which is devoted to the higher education of a particular State. About twenty of these have been issued (1895). D. C. GILMAN.

University Extension: an educational movement, the main idea of which is to furnish teaching by university instructors to those who, for any reason, can not reside at the universities. The term extension may, in this connection, be interpreted as meaning both (1) the extension of university activities beyond university premises, and (2) the extension of university studies beyond the period of youth and throughout adult life. Its constituency is the large class of people, itself made up of all classes, in the towns and cities, who wish to read and study under such direction as colleges and universities can give through the living teacher. It has been termed the school for adults, the university of the busy. In the words of Prof. James Stuart, of London, at whose suggestion this work was first organized, it is an attempt "to bring the universities and the people together." It is not, however, to be understood as designed for those only "who can not come to the universities," if that be interpreted to mean those who have never had and never can have the advantages of resident study. It is rather one form of education for adults of every class, and finds among its constituents (1) college graduates who desire to continue courses of reading and study in their favorite subjects; (2) teachers who wish university instruction and direction both as to method and as to subject-matter; (3) those who seek relief from the routine of business and toil; (4) parents who desire to be closer intellectual companions with their children in the schools; (5) those who desire to be better informed upon matters pertaining directly to citizenship, such as political science, history, social science; and all, in general, who desire such stimulus and instruction as may thus be enjoyed. Whatever may have been the original design as to the precise class for whom this form of instruction was intended, it may now be said to contemplate as wide a variety of constituents as society itself presents, attempting in every practicable way to bring the teaching resources of universities within reach of those outside the universities for the enrichment of life and the improvement of culture.

Method.—University teaching is thus extended principally by three methods: (1) By lectures at intervals of one or two weeks, conducted by the university instructor, with special aids for student work in the interval; (2) by correspondence, lesson-sheets being prepared and mailed to the student, with detailed instructions how to proceed, and with test exercises for work; (3) by means of classes organized in the city or the suburbs about the university itself, which classes are taught by the university instructor in the same subjects and by the same methods as classes upon the university premises. Usually the second and third varieties of university extension instruction are sought by those who, while they can not become residents at the universities, desire to pursue courses exactly parallel with those pursued in the universities themselves, either because they find such courses especially adapted to their present needs or because they wish university recognition with a view to subsequent residence study. The method first described, however, is that usually denoted by the term university extension, and is especially suited, not to those who desire to pursue, as non-resident students, the courses laid down in the curricula of universities, but rather to those in every walk of life who desire a broader view of those subjects taught in the universities, a knowledge of which is essential to general culture and intelligent citizenship.

The distinctive features of university extension lectures are (1) the connected series instead of the single lecture, and (2) the aids to student work already referred to. These consist of (*a*) the syllabus or printed outline of the lecture, which is furnished to each member of the audience or class; (*b*) references for reading designated by the lecturer; (*c*) the traveling library, a collection of books especially bearing upon the subjects discussed; (*d*) the review-hour in connection with each lecture, affording opportunity for familiar discussion, and for question and answer between the instructor and the audience; (*e*) the written paper upon topics suggested by the lecturer and designated in the syllabus. The performance of all work is voluntary with the student, it being open to all who so desire to do nothing further than attend the lectures. The lecturer gives instruction in six or twelve lectures at intervals of one or two weeks. The lecture usually lasts one hour. Its aim is to interest the hearer, and to give him a working knowledge of the subject, such as will stimulate his desire for further knowledge and will guide him in his thinking and reading. After or before the lecture-hour the lecturer reviews and discusses the preceding lecture with such of his hearers as desire this. In this

exercise use is made of such written papers as members of the audience may have furnished to the lecturer. Usually a large proportion of the lecture audience remains to the review-hour. Those attending the lectures thus have the opportunity, the use of which is entirely voluntary, of reading some or all the works assigned, and further of writing for examination and comment short papers on designated topics, and so of suggesting the basis for general discussion at the review. Usage varies in the different colleges as to the recognition accorded to those who do the work. In some cases a certificate of readings performed and written exercises rendered is given to the student in the name of the university. In the case of courses of twelve lectures, where the nature of the course permits it, the student who performs all the designated work and takes the university examination is, by some institutions, allowed credit as a non-resident student of the university, and this credit stands in his favor if he at any time becomes a resident student.

Obviously not all subjects of study are equally adapted to teaching by university extension lectures. This is especially true of subjects that can be pursued best in laboratories, as well as the direct teaching of languages and mathematics. However, owing both to the nature of the subjects as they lend themselves to this kind of teaching and to the desires of the people, the subjects especially demanded are literature, history, sociology, economics, political science, and certain phases of biblical study. Geology, chemistry, and biology have received considerable attention, and the study of the history of art and art criticism is also successfully carried on in this manner.

Organization.—The organization of the university extension center is comparatively simple. Two or three persons interested in securing such an organization for their town or neighborhood usually procure university extension literature from any college engaged in the work, and proceed to interest first of all a few persons of public spirit and general influence in the community. Through these interest in the subject may easily be spread until it becomes practicable to secure a general meeting representative of the various elements in the town. Sometimes a representative from the university is present to give a specimen lecture, and to explain briefly and simply the nature of the work, answer any questions that may arise, and give such advice as may be needed. As soon as the interest warrants it, steps are taken to form a simple organization consisting usually of a president, secretary, treasurer, and local committee. A choice of lecturer and course is then made, a canvass for tickets proceeds, and in due time the work begins. Circulars of information explaining all practical details are commonly furnished on application by the institutions engaged in this work.

History.—As a differentiated and organized form of educational activity university extension was first recognized in 1873, when "the University of Cambridge (England), at the instance of James Stuart [then fellow and lecturer of Trinity College, and now (1895) member of Parliament], offered to supply the towns of England with capable instructors in the various departments of knowledge, under the supervision and with the sanction of the university itself." As early as 1867 Prof. Stuart had been invited by a company of ladies in the north of England to give them a lecture on teaching.* He replied that, "as a thing is often best described by showing a piece of it," he would prefer to give them a course of lectures, in which he would attempt to teach something. The thought prompting Prof. Stuart in sending this reply was the very germ of university extension methods—namely, that the single lecture should be replaced by the series of lectures on a given subject, occurring at intervals, and that these lectures were to be distinctively teaching lectures. The lectures by Prof. Stuart constitute really the beginning of university extension, and they clearly display the evolution of the special features of this kind of instruction—namely, the syllabus, the weekly paper, and the review. Prof. Stuart says that he received the idea of the syllabus from Prof. Ferrier, of St. Andrews, who had used the syllabus in his own classes as a means of indicating to his students what sort of notes he desired them to take. Prof. Stuart found that oral questioning of his audience was not in all respects satisfactory, and asked his hearers to write short papers upon various topics connected with the lectures and mail them to him. At the following meeting these papers were commented upon as their contents seemed to demand. The origin of the so-called class or review-hour is interesting. One of the managers of the Crewe Railway works asked Prof. Stuart in 1867 if he would give a lecture to the workingmen. He accepted the invitation, and spoke on the subject of meteors. The lecture received unusual and gratuitous advertisement by copious showers of meteors that fell the evening before, and was so acceptable that the men requested him to give them a course. When Prof. Stuart came for the second lecture he found a number of his hearers gathered about some diagrams that had been left in the hall, discussing them with much interest. The result was that he was asked if he would come to the hall somewhat earlier than the time for the beginning of the lecture, to explain and further discuss these illustrations. This gave him an idea of the so-called "class" or review, which is a feature of the university extension lecture. Soon after this Prof. Stuart gave similar courses, accompanied by the features described, in Leeds, Sheffield, Manchester, and Liverpool, so that when, in 1873, the university took up the work its characteristic features were well developed.

All conditions were favorable for the success of the movement. The great and rich towns, with few exceptions (Manchester had a college), were practically untouched by university influence. The two great universities of England were utilized by a small fraction of the population. The general diffusion of easily accessible free schools and institutions of all grades, so familiar in the U. S., was unknown in England. The idea of establishing teaching posts or "centers" for university teaching in the towns met with eager response. Centers were first established in the autumn of 1873 in Nottingham, Derby, and Leicester, and since that time the system has been an integral part of the university's work. In 1876 the London Society for the Extension of University Teaching was formed for the purpose of carrying on this work in the metropolis. In 1878 the University of Oxford engaged in the work, but for a time abandoned it. That university, however, resumed it in 1885, and has carried it on successfully ever since.

The first direct efforts to introduce this form of teaching into the U. S. were made in 1887 by persons connected with Johns Hopkins University.* The subject was first publicly presented to the American Library Association at their meeting in Sept., 1887. It was at once taken up in a practical way by J. N. Larned, superintendent of the Buffalo Library. Mr. Larned secured the services of Edward W. Bemis, a graduate student of the Johns Hopkins University, and by him twelve lectures were delivered, at intervals of one week, upon *Economic Questions of the Day.* The regular English university extension system was followed. The first formal organization of the work on a large scale, however, was effected in 1890 within and about Philadelphia through the exertions of Provost William Pepper and his associates in the University of Pennsylvania. George Henderson was sent by them to England, and made a valuable report on the English movement. The name of the first organization was the Philadelphia Society for the Extension of University Teaching. The society was soon reorganized on a larger scale, and was called the American Society for the Extension of University Teaching. This society has continued its work vigorously and successfully until the present time (1895), and has formed the most considerable central organization for the work in the eastern part of the U. S.† The University of New York took up the work, and organized it on a large scale in the spring of 1891. The Legislature appropriated $10,000 for the purpose of organization. In the autumn of 1891 the Chicago Society for University Extension was formed. It drew its lecturers from a number of allied colleges, including the Universities of Illinois, Wisconsin, Indiana, the Northwestern University at Evanston, Ill., Lake Forest University, Illinois, Beloit College, and Wabash College. Other central organizations for prosecuting this work were formed at Brown University, Bowdoin College, Colby University, Colgate, Rutgers, the Universities of Cincinnati, Michigan, Minnesota, Iowa, Missouri, Kansas, and California. The most noteworthy step, however, in the development of this work in connection with a university in distinction from an organization like the Philadelphia society was taken when, at the organization of the University of Chicago, which opened in Oct., 1892, a distinct division of the university was equipped for the prosecution of the work of university extension. A separate faculty

* See Sadler, *The Development of University Extension* (Philadelphia, 1892).

* See article by Prof. Herbert B. Adams, *The Forum* (July, 1891).

† See pamphlet entitled *Review of the Work of the American Society, etc.*, E. J. James (1895).

was selected for this work, a special set of administrative officers was chosen to organize and direct it, and special offices were set apart and equipped for the business involved. The administrative staff consists of a director and five secretaries of departments—the departments, namely, of lecture-study, correspondence-study, and class-study, library, and district organization and training. This organization has been substantially continued until the present, and has been found essential to the prosecution of the work as conceived and planned.* The results of the efforts of some of these organizations are partially shown in tables below. It may be added, however, that the work attained so great importance as a form of education that a special congress on university extension was held among the world's congresses at Chicago in the summer of 1893, and the twenty-first anniversary of university extension was celebrated by a congress of workers from every part of the world assembled in London in June, 1894.

Early Promoters.—Names forever to be associated with the beginnings of this work are those of Prof. James Stuart; university magnates like Bishops Westcott and G. F. Browne, (Cambridge), and the Right Hon. Arthur Acland (Oxford), Minister of Education in Lord Rosebery's government; organizers like Dr. R. D. Roberts and T. J. Lawrence (Cambridge), and M. E. Sadler (Oxford); men of reputation in the lecturing field, like Dr. R. G. Moulton (Cambridge), Rev. T. Hudson Shaw (Oxford), Churton Collins (London). It is right to mention also names of distinguished local organizers, like those of Dr. Paton, of Nottingham, and Miss Jessie D. Montgomery, of Exeter. The name of Dr. Moulton belongs to both Great Britain and the U. S.; under the auspices of the Philadelphia organization at its initiation, and subsequently of the University of Chicago, he has had perhaps a larger share than any other individual in representing university extension before the people of the U. S.

The Movement in Great Britain and in the United States.—The motives for the extension of university teaching and the constituency which responds to this movement have thus far been somewhat different in Great Britain from what they have been in the U. S. In the former country there has been a much more keenly felt need for bringing educational advantages within reach of the people. College education has been by no means so generally diffused among the people of Great Britain as among those of the U. S. Among wage-earners in England there is a much larger class of men of good intelligence who earnestly desire educational advantages, which formerly have been beyond their reach. Further, in the English schools there is a large number of "pupil-teachers" who are able, by attending university extension courses and taking examinations, to make direct progress toward gaining their full teachers' certificates. These circumstances and others which they imply have made for university extension in England a constituency to which, in a sense, it may be said the universities have reached down. In the U. S., on the other hand, it would be more correct to say that the universities have reached out, and have entered into co-operation with all classes of persons outside of their own premises, not so much for the enlightenment of the uneducated as to meet the demands of intelligent people of every class for co-operation in the interests of the intellectual life of the country at large. In Great Britain one peculiar result of university extension has been the establishment of so-called university extension colleges, the best examples of which are at Reading and at Exeter. In the U. S. such a result as this would be quite impossible, since the latter country has been filled with free high schools, academies, institutes, and small colleges from the earliest colonial times.

Results.—The chief central organizations for the prosecution of university extension are those of Cambridge, Oxford, and London in England, and of Philadelphia (the American Society for the Extension of University Teaching), Albany (University of the State of New York), Rutgers College, at New Brunswick, N. J., and Chicago (the University of Chicago) in the U. S. The University of Wisconsin is organizing a separate department for this purpose.

The following statements, necessarily somewhat incomplete, will convey an idea of the results of the attempts to extend university teaching: Cambridge, England, reports (for 1893–94) 137 courses given, with an average total attendance for that season of 10,600; Oxford, 223 courses, 23,500 attendance; London, 152 centers, 15,150 attendance; Philadelphia reports (1894–95) 91 active centers, at which 126 courses have been given, with a total (estimated) attendance of 20,000. The extension department of the University of the State of New York reports (1894–95) 20 active centers, at which 31 courses have been given, with a total attendance at the lectures of 50,489; Rutgers (1894–95) reports 19 centers, at which 14 courses have been given, with a total attendance of 1,518. The University of Chicago makes the following report of the three departments of university extension work, as developed since Oct., 1892, at which date the university began its work:

TABULATED STATEMENT OF THE WORK OF THE UNIVERSITY EXTENSION, 1892–95.

Lecture-study Department.

QUARTER.	Autumn, 1892.	Winter, 1893.	Spring, 1893.	Totals.	Autumn, 1893.	Winter, 1894.	Spring, 1894.	Totals.	Autumn, 1894.	Winter, 1895.	Spring, 1895.	Totals.
Number of courses	38	81	2	121	35	39	9	83	64	52	11	127
Number of active centers	31	58	2	91	33	35	9	77	62	44	10	116
Number of lecturers	9	20	2	20	17	16	4	17	18	17	2	18
Total attendance	10,070	16,443	215	26,728	5,120	7,059	1,875	14,054	11,968	9,724	2,065	23,757
Average attendance at each lecture	265	203	108	.....	147	181	208	.....	187	187	188	.....
Average attendance at each class	101	99	15	.....	80	96	145	.....	127	157	126	.....

Class-study Department.

QUARTER.	Autumn, 1892.	Winter, 1893.	Spring,* 1893.	Totals.	Autumn, 1893.	Winter, 1894.	Spring, 1894.	Totals.	Autumn, 1894.	Winter, 1895.	Spring, 1895.	Totals.
Number of classes	4	7	....	11	1	15	13	29	49	30	23	102
Enrollment	50	79	....	129	5	109	68	182	1,156	689	352	2,197
Average number per class	13	11	....	.. .	5	7	5	....	24	23	17	....
Number of instructors	4	7	....	7	1	13	10	13	33	22	14	33

Correspondence-study Department.

QUARTER.	Autumn, 1892.	Winter, 1893.	Spring, 1893.	Summer, 1893.	Autumn, 1893.	Winter, 1894.	Spring, 1894.	Summer, 1894.	Autumn, 1894.	Winter, 1895.	Spring, 1895.	Summer, 1895.
Number of courses in progress	12	25	26	28	20	29	27	25	30	34	....	....
Enrollment	635	692	688	695	673	466	461	419	380	376	....	....
Number of instructors	3	11	10	13	16	17	17	15	27	27	....	....

* No courses offered.

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* See article in *University Extension* (Philadelphia, Dec., 1894).

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NATHANIEL BUTLER.

University of the South: an institution at Sewanee, Tenn., founded by Leonidas Polk, Bishop of Louisiana, and chartered in 1858. Its cornerstone was laid in 1860, but buildings and endowments ($300,000) were swept away by the civil war. The domain of 10,000 acres was saved from lapsing by the planting of a small school by Bishop Quintard of Tennessee in 1868. In 1870 a collegiate department was added, in 1873 a theological department was opened, in 1892 a medical, and in 1893 a law department. The growth of the institution has been steady in spite of its lack of endowment. The faculty in 1900 numbered sixty-two professors and instructors, the students 518. The bishops and three elected representatives of fifteen dioceses of the Protestant Episcopal Church in the Southern States constitute the board of trustees. The administrative head is the vice-chancellor, B. Lawton Wiggins, M. A. The tone of the institution is conservative and English. *The Sewanee Review* is the literary organ of the university. B. LAWTON WIGGINS.

University of the State of New York: an organization including all incorporated institutions of academic and higher education in New York, with the State Library, State Museum, and such other libraries, museums, or other institutions for higher education in the State as may be admitted by the regents to the university. It was incorporated May 1, 1784; reorganized Apr. 13, 1787; had its powers enlarged and its laws revised and consolidated June 15, 1889, and Apr. 27, 1892. Its object is, in all proper ways, to encourage and promote academic and higher education throughout the State.

Besides the State Library and State Museum there are in the university (1895) 466 institutions—381 academies and high schools, and 85 degree-conferring and professional institutions, viz.: 21 colleges of arts and science for men, 8 for women, and 5 for men and women, 7 law schools, 18 medical schools, 3 schools of pharmacy, 12 theological schools, 1 polytechnic, and 10 special institutions. Of these, 1 college of arts and science, 1 medical college, 4 theological schools, 2 law schools, and 1 special school confer no degrees.

The 18 medical schools include 1 homœopathic, 1 eclectic, 2 for women, 1 of dentistry, 2 veterinary, and 1 post-graduate college. Of the 12 schools of theology 3 are Baptist, 2 Presbyterian, 1 each Lutheran, Episcopal, Universalist, Christian, Roman Catholic, German Lutheran, and Reformed. The 10 special schools (except the Dudley Observatory, which is part of Union University), include only institutions with degree-conferring powers, though to show the full facilities of the State many institutions doing similar work should be included in this list. The law ranks as "colleges" only those with degree-conferring powers. These include 2 popular institutions (Chautauqua and Pratt Institute), 3 pedagogic colleges, 1 each of art, music, and magnetics. While there are in the State 76 institutions in which degrees may be earned, there are only 55 degree-conferring bodies, as in a university or a college having a professional school attached a single board of trustees confers all degrees. Columbia thus confers degrees in the arts, science, law, and medicine. Union confers degrees in law, medicine, and pharmacy; the University of the City of New York in law, medicine, theology, and pedagogy; St. Lawrence and Alfred Universities in theology; Cornell in law, pharmacy, and engineering; Syracuse in medicine and art; Niagara in law, medicine, and theology.

The powers of the university are vested in twenty-three regents, including the Governor, Lieutenant-Governor, Secretary of State, and Superintendent of Public Instruction, *ex officio*. Regents are elected by the two houses of the State legislature in joint session, in the same manner as Senators of the U. S., and serve without salary and for life.

The regents have power to incorporate, and to alter or repeal the charters of colleges, academies, libraries, museums, or other educational institutions belonging to the university; to distribute to them all funds granted by the State for their use; to inspect their workings and require annual reports under oath of their presiding officers; to establish examinations as to attainments in learning; and confer on successful candidates suitable certificates, diplomas, and degrees, and to confer honorary degrees.

They apportion annually an academic fund of $106,000, a part for buying books and apparatus for academies and high schools raising an equal amount for the same purpose, and the balance on the basis of attendance and of the regents' examinations.

The regents meet regularly on the second Thursday of February and the second Wednesday in December. Numerous special meetings are held as called by the chancellor or on request of five regents.

The university convocation of the regents and the officers of institutions belonging to the university, for consideration of subjects of mutual interest, is held annually at the Capitol in Albany usually on the first Wednesday, Thursday, and Friday after July 4.

The work of the university is divided into five departments:

1. *Executive*—including incorporations, supervision, inspection, reports, finances, and all other work not assigned to another department.

2. *Examinations*—including preliminary, law student, medical student, academic, higher law, medical, library, and any other examinations conducted by the regents.

3. *Extension*—including the work of extending more widely opportunities and facilities for education to adults and others unable to attend the ordinary institutions of higher education.

4. *State Library*—including public libraries department, duplicate department, library school, and all other library interests intrusted to the regents.

5. *State Museum*—including the work of State geologist, palæontologist, economic geologist, botanist, entomologist, and zoölogist, together with all other scientific interests of the university.

Libraries.—Besides the State Library of over 160,000 volumes, which is open daily throughout the year, except Sundays, from 8 A. M. to 10 P. M., there are eight other libraries of more than 3,000 volumes each—i. e. those of the Albany Female Academy, Albany Institute, Medical College, High School, St. Agnes's School, Court of Appeals, Normal College, and of the Young Men's Association, the last having nearly 20,000 volumes. MELVIL DEWEY.

University Settlements: homes in the poorer quarters of a city, where educated men and women may live in daily personal contact with the working people. Here they may identify themselves as citizens with all the public interests of their neighborhood, may co-operate with their neighbors in every effort for the common good, and share with them, in the spirit of friendship, the fruit and inspiration of their wider opportunities.

No definite date can be assigned for the origin of the university settlement movement. The establishment in London of the Working Men's College, in 1860, by Frederick Denison Maurice, and the beginning of the university extension movement from Cambridge in 1867, were among the early expressions of the spirit that later was to produce

the settlement. The essential idea of settlement work—the establishing of the *home* among the poor—had its rise at Oxford. In 1867 Edward Denison, an Oxford man of wealth and position, went to John Richard Green, the English historian, then vicar of St. Philips, at Stepney, in London, and asked an opportunity to live and work in his parish. Denison lived but a short time, and left his work still in the form of an experiment. During the time of his residence in the East End he discussed with a few friends plans for the social elevation of the poor, and the idea of the university settlement was then evolved, but no steps were taken for beginning the work. In 1875 Arnold Toynbee, tutor to the Indian civil service students at Oxford, decided to spend his summer vacation at Whitechapel, London. This he did for several successive summers, becoming an intellectual leader among the working men of the vicinity. After his death, as a memorial to him, his friends at Oxford determined to secure a hall at the East End, where, through university extension and other methods, it was designed to give the working men of the neighborhood the benefit of education. It was due to the influence of Samuel A. Barnet, vicar of St. Jude's, in Whitechapel, that this original plan was enlarged, and in addition to the lecture-hall a settlement for university men, Toynbee Hall, was established. It began its work in Whitechapel in 1885, with Mr. Barnet as warden. The movement was rapid in its development, and within a few years settlements were started in various districts in London and in several of the cities of Scotland, and in 1887 the founding in New York city of the Neighborhood Guild, which in 1891 came under the control of the University Settlement Society, marked the beginning of the settlement movement in the U. S.

Methods of Working.—The most vital part of the work of a settlement is the expression, in the widest measure, of a wise friendship toward its neighborhood. This attitude results in many opportunities for usefulness that can not be classified. The definitely organized efforts of every settlement are mainly social, educational, and civic. In a neighborhood where overcrowding and poverty have destroyed the best social life, the settlement seeks to be a social center. It provides entertainments, organizes clubs, and in general constitutes itself a meeting-ground for the people of the neighborhood. Among the people who spend their days in toil there is the greatest need of elevating relaxation. In offering them the hospitality of a home of refinement and culture, the settlement helps to satisfy this need. Much work is done for the children through books, music, pictures, and story-telling; every attempt is made to brighten their lives and awaken in them a desire for better things. The settlement also attempts to bring together in social intercourse all classes of society, with the hope that, through the better mutual understanding and wider sympathies that must result, aid may be given toward the solution of economic and civic problems. In its educational work a settlement aims to give a fuller life and broader sympathies, rather than any technical perfection. Toynbee Hall, London, and Hull House, Chicago, are "outposts" of university extension, and all settlements have undertaken some work of this kind. The settlement exists not only as an education for the neighborhood, but as a school for the workers, many of whom take part in the work with a view to study and investigation, in order to obtain accurate data with regard to the problems of poverty. In the settlements in general an earnest enthusiasm is felt for gaining and promulgating a right understanding of the aims and methods of the labor movement. When no definite attitude is taken toward the movement a general sympathy is accorded it, and in many settlements active work is done in organizing unions and giving them support. The first duty of a settlement-worker is to fulfill the offices of a good citizen. As far as possible the resident takes an active part in local government, and serves on committees and boards appointed to look after the health, education, and general well-being of the neighborhood. In this way important service is rendered in a community where unsuitable laws often go unchanged in the absence of intelligent criticism, and good laws are badly administered because of the lack of wise direction.

The settlements are generally supported by associations formed for that purpose. These organizations do not attempt to control the work to any extent. The management of each settlement is delegated to a local committee or to the resident workers. The head worker is in direct charge of the settlement, and is free to plan and develop its activities. The service is voluntary, each resident worker paying part of the current expenses of the house. The head worker only receives a salary. The expenses of the clubs, classes, etc., are usually paid by the members. The character and scope of the work are determined largely by the tastes and ability of the residents, and by the needs of the neighborhood.

Leading Settlements.—The leading English settlements are in London. Among them are Toynbee Hall, Oxford House, the Woman's University Settlement, Mayfield House, and Mansfield House. In Scotland settlement-work has been undertaken in both Glasgow and Edinburgh.

In the U. S. the increase in the number of settlements has been rapid. At the present time (1895) they exist in New York city, Brooklyn, Buffalo, Jersey City, Boston, Hartford, Philadelphia, Cleveland, Cincinnati, Pittsburgh, St. Louis, and San Francisco. Among the leading settlements in the U. S. are the University and College Settlement in New York city, Hull House in Chicago (which, however, designates itself a social rather than a college or university settlement), Philadelphia College Settlement, Denison House and Andover House, Boston.

The movement has also spread to India, where there is a missionary university settlement in Bombay.

ADA S. WOOLFOLK.

Unlawful Assembly: See RIOT.

Unleavened Bread, Feast of: See PASSOVER.

Unst: the northernmost of the SHETLAND ISLANDS (*q. v.*).

Unterwalden, oon'*ter*-*vaăl*-den: canton of Switzerland, bordering N. on Lake Lucerne; area, 295 sq. miles. It is surrounded and traversed by mountain ranges, forming two long, narrow valleys which open toward Lake Lucerne. There are several other minor lakes in the canton. The surface is rarely level enough for agriculture, but the forests are extensive and rich in timber. Apples, pears, and chestnuts are raised in great quantities and of excellent quality. Cattle-breeding and dairy-farming are the chief employments, cheese and timber the principal exports. Pop. 27,581, who are Roman Catholics and speak German. Unterwalden is divided into two semi-cantons, having certain federal relations in common, but their local governments separate. Obwalden, or Upper Unterwalden, has an area of 183 sq. miles; pop. (1888) 15,043. Nidwalden has an area of 112 sq. miles; pop. (1888) 12,538.

Revised by M. W. HARRINGTON.

Unwin, WILLIAM CAWTHORNE, F. R. S.; engineer; b. at Coggeshall, Essex, England, 1838; educated at the City of London School; served an apprenticeship in the works of Sir William Fairbairn at Manchester 1855–62; instructor at the Royal School of Naval Architecture, South Kensington, 1868–72; Professor of Mechanical and Hydraulic Engineering, Royal Indian Engineering College, Cooper's Hill, 1872–84; Professor of Engineering, Central Institution of the City and Guilds Institute, South Kensington, 1884–. His principal works are *Wrought-Iron Bridges and Roofs* (1869); *The Elements of Machine Design* (1877; 11th ed. 1890–91); and *The Testing of Materials of Construction* (1888).

Unyo'ro: one of the largest of the native states of inner Africa. It is N. and N. W. of Uganda, which separates it from Victoria Nyanza, and it lies between Lake Gita on the E. and Albert Nyanza on the W. It is an elevated, fertile, and populous country, whose king, a great slave raider and trader, has been much opposed to the introduction of white influences. His power was much weakened by the war upon him (1893–94) by the British native forces from Uganda, and the country is likely soon to be brought entirely under the control of Great Britain. The inhabitants (Wanyoro) are farmers and cattle-raisers. Polygamy is common. The military organization is inferior to that of Uganda, and the Wanyoro have generally been worsted in their many wars with the Waganda.

C. C. ADAMS.

Upanishads [Sanskr.]: a group of over 100 mystical treatises, mostly in prose, attached to the Brāhmanas or ritualistic precepts which form the second division of the Veda. They contain the beginnings of Hindu philosophy, and cast aside matters of rites and ceremony to deal with the mysteries of creation and existence. See the article SANSKRIT LITERATURE; Monier-Williams, *Indian Wisdom* (4th ed. London, 1895); and vols. i. and xv. of the *Sacred Books of the East*, edited by Max Müller (Oxford, 1879, 1884).

Upas [from Malay *ūpas* in *pūhn-ūpas*, upas-tree, liter., poison-tree; *pūhn*, tree + *ūpas*, poison]: a tree indigenous

to the forests of Java, where it is called *Bohun upas*; the scientific name is *Antiaris toxicaria*. The viscid juice of the plant dries into a resinous mass termed by the Javanese *antiar*. This exudation is extremely poisonous, and when introduced into the circulation of an animal death speedily ensues. The stories of the early travelers respecting the pernicious character of exhalations from the foliage of this tree are believed to be gross exaggerations. Specimens of the plant are cultivated in the conservatories of all large botanic gardens. The plant belongs to the bread-fruit family. The leaves are ovate or obovate, 4 or 5 inches long and conspicuously veined. The minute flowers are monœcious. The fruit is drupaecous. Other species of *Antiaris* are known to be innocuous.

Upcott, William: historian and bibliographer; b. in Oxfordshire, England, in June, 1779; served an apprenticeship to a London bookseller; became purchasing agent for several book-collectors, and on the foundation of the London Institution in the Old Jewry, 1806, was appointed sub-librarian, the celebrated Porson being librarian. He made the most extensive known collection of autographs, which comprised more than 36,000 letters; was the discoverer and first editor of Evelyn's *Memoirs*; furnished most of the originals for the publication of the *State Letters* (1820) of Henry Hyde, second Earl of Clarendon, and Ralph Thoresby's *Diary and Correspondence* (4 vols., 1830–32); wrote a continuation of Edmund Carter's *History of the County of Cambridge* (1819), and a considerable part of a *Biographical Dictionary of Living Authors of Great Britain and Ireland* (1816), and published *A Bibliographical Account of the Principal Works relating to English Topography* (3 vols., 1818). He resigned his position at the London Institution 1834. D. at Islington, Sept. 23, 1845. His collection of autographs was dispersed at auction in 1846, but a large part was secured by the British Museum. Revised by H. A. Beers.

Upfold, George, M. D., D. D., LL. D.: bishop; b. at Shemley Green, near Guildford, England, May 7, 1796; taken by his parents to the U. S. 1802, the family settling at Albany, N. Y.; graduated at Union College 1814, and in medicine in New York 1816; commenced practice at Albany, but soon entered upon the study of theology; was ordained in the Protestant Episcopal Church 1818; was minister at Lansingburg, N. Y., 1818–20; rector of St. Luke's, New York, 1820–28, being also assistant minister of Trinity church 1821–25; rector of St. Thomas's church, New York, 1828–31, and of Trinity church, Pittsburg, Pa., 1832–50; and was consecrated Bishop of Indiana Dec., 1849. D. in Indianapolis, Ind., Aug. 26, 1872.

Upham, Charles Wentworth: clergyman and author; b. at St. John, New Brunswick, May 4, 1802; son of a loyalist refugee, judge of the supreme court of the province; graduated at Harvard College 1821, at Cambridge Divinity School 1824; colleague of John Prince, pastor of the First church in Salem, 1824–44; left the profession on account of bronchial weakness; edited *The Christian Register* 1845–46; traveled and lectured as agent of the Massachusetts board of education; was elected mayor of Salem; was member of the Massachusetts House of Representatives in 1849, of the State Senate 1850–51, of the national Congress from the Sixth District 1854–55; State Senator 1858, Representative 1859–60. During his ministry, which fell in controversial times, Mr. Upham made his mark as a writer by his *Letters on the Logos* (1828) and *Prophecy as an Evidence of Christianity* (1835), both written in the Unitarian interest. The *Lectures on Witchcraft, comprising a History of the Salem Delusion of 1692*, afterward, in 1867, rewritten and expanded into an elaborate work (in 2 vols.) appeared in 1831. Mr. Upham was a diligent student of New England times and men. For Sparks's *American Biography* he wrote the *Life of Sir Henry Vane* (1835). In 1856 appeared from his pen the *Life, Letters, and Public Services of John Charles Fremont*. His last work was a *Memoir of Timothy Pickering* (4 vols., 1867–72). D. in Salem, Mass., June 15, 1875.

Upham, Thomas Cogswell, D. D.: educator and author; b. at Deerfield, N. H., Jan. 30, 1799; graduated at Dartmouth College 1818, and at Andover Theological Seminary 1821; became assistant teacher of Hebrew in the seminary, and translated Jahn's *Biblical Archæology*; in 1823 was ordained pastor of the Congregational church in Rochester, N. H.; in 1825 was chosen Professor of Mental and Moral Philosophy in Bowdoin College. His principal works are *Manual of Peace* (1830); *Philosophical and Practical Treatise on the Will* (Portland, 1834); *Elements of Mental Philosophy* (1839; abridged ed. 1864); *Outlines of Disordered and Imperfect Mental Action* (New York, 1840); *Life of Faith* (1848); *Treatise on the Divine Union* (Boston, 1851; London, 1858); *Religious Maxims* (2d ed. Philadelphia, 1854); *Method of Prayer* (London, 1859); and *Christ in the Soul* (210 hymns, New York, 1872). D. in New York, Apr. 2, 1872. Revised by G. P. Fisher.

Upington, Sir Thomas, K. C. M. G., Q. C.: jurist and statesman; b. in County Cork, Ireland, Oct. 28, 1844; educated at Cloyne Diocesan School and Trinity College, Dublin, where he took the degree of M. A.; called to the Irish bar 1867; became secretary to Lord O'Hagan, Lord Chancellor of Ireland; settled at the Cape of Good Hope 1874; elected member of the Legislature for the division of Colesberg 1878; Attorney-General for the colony 1878–81; elected leader of the opposition in the Cape Parliament; Prime Minister of the Cape Colony 1884–86; Attorney-General 1886–90; appointed a puisne judge in the Supreme Court at the Cape 1892; is one of her Majesty's counsel for the Cape, and as lieutenant-colonel commands a volunteer regiment in Cape Town.

Upjohn, Richard: architect; b. in England, Jan. 22, 1802. He became a cabinet-maker and builder first in England, and followed that trade afterward in the U. S., having settled in New Bedford, Mass., about 1829, and in Boston a few years later. As trained architects were rare in the U. S. at that time, he was employed occasionally on minor pieces of architectural designing, and afterward built St. John's church in Bangor, Me. The iron fence around Boston Common, with its entrance gate-ways, was put up from his designs. Trinity church, New York, was to be rebuilt in 1839, and Mr. Upjohn's designs for the new structure were accepted. The building was not finished until 1846. It was built with unusual care and great expense for the time, and its design was studied from the English Perpendicular, adapted with considerable skill. In connection with the Church of The Holy Trinity in Brooklyn, built about the same time by another architect, it established the character of American churches for a number of years. The tower and spire were especially notable, not only for their general architectural merit, but also because of the great height of the steeple (285 feet), a height not reached for many years by any other building in the U. S. After this many other churches were built by this architect, one of the most successful being Trinity chapel, belonging to the same foundation as Trinity church, and completed about 1856. This is a study in English Gothic of an earlier style than that of Trinity church, highly decorated, and of unusual solidity and excellence of construction. The Church of the Ascension, in Fifth Avenue; University Place Presbyterian church, and the Church of the Holy Communion —all in New York city; several churches in Brooklyn; St. Stephen's at Providence; St. Paul's at Buffalo; St. Paul's at Baltimore; and a number in other parts of the country were built by Mr. Upjohn. He built also a number of country-houses, in many of which there is considerable architectural character, much beyond what was usual at the time of their erection; also Trinity building in New York, and the Corn Exchange Bank, which was replaced in 1893 by a sixteen-story building. His latest important building was St. Thomas's church, at Fifth Avenue and Fifty-third Street, New York, finished in 1870. The exterior of this church is remarkable for its tower capped by a lantern instead of spire. Mr. Upjohn was president of the American Institute of Architects while it was a New York society merely, from 1857 till about 1868, and was then the president of the enlarged and nationalized institute until 1876. D. at Garrison's, Putnam co., N. Y., Aug. 16, 1878. Russell Sturgis.

Upolu': an island of Samoa (*q. v.*).

Upper Alton: city; Madison co., Ill.; on the Burl. Route and the Chi. and Alton railways; 2 miles N. of Alton (for location, see map of Illinois, ref. 8–D). It is the seat of Shurtleff College (Baptist, opened in 1827, chartered in 1835), which at the end of 1893 had 19 professors and instructors, 269 students, 26 scholarships, 2 endowed professorships, and 10,000 volumes in its library. The city has an attractive public park, street-railway, manufactory of roof-tile, and 2 monthly periodicals. Pop. (1890) 1,803; (1900) 2,373.

Upper Peru (Span. *Alto Peru*): one of the colonial names for the country now called Bolivia (*q. v.*).

Upper Sandus'ky: village; capital of Wyandot co., O.; on the Sandusky river, and the Col., Hock. Val. and Tol. and

the Penn. railways; 17 miles W. of Bucyrus, and 60 miles S. of Toledo (for location, see map of Ohio, ref. 3–E). It contains foundries, machine-shops, carriage-factories, a national bank with capital of $105,000, and a daily, 2 semi-weekly, and 2 weekly newspapers. Pop. (1880) 3,540; (1890) 3,572; (1900) 3,355. EDITOR OF "UNION."

Upsa'la: town of Sweden; 45 miles N. W. of Stockholm; has a beautiful cathedral and a flourishing university (see map of Norway and Sweden, ref. 10–G). The cathedral was built between 1289 and 1435, and is 370 feet long, 128 feet broad, and 92 feet high. Its interior is magnificent and richly decorated, but its exterior has suffered much from fire. Among its relics are the silver shrine of St. Eric, the tomb of Gustavus Vasa, the monument of Linnæus, etc. The university was founded in 1477 by Sten Sture, developed rapidly, produced a great number of illustrious scholars, and at times exercised a decisive influence on Swedish civilization. It has about 2,000 students and its library contains over 250,000 volumes. Pop. (1895) 21,428. Revised by M. W. HARRINGTON.

Upshur, ABEL PARKER: cabinet officer; b. in Northampton co., Va., June 17, 1790; studied law under William Wirt at Richmond, where he practiced 1810–24; was representative in the Legislature, and in 1826 was appointed a judge of the general court; in 1829 was a member of the State constitutional convention, and in 1841 was appointed Secretary of the Navy, but after Webster's resignation was made Secretary of State in 1843. In politics he belonged to the pro-slavery party, and was in full accord with President Tyler's policy of annexing Texas. He was killed by the bursting of a gun on board the U. S. steamer Princeton on the Potomac river, Feb. 28, 1844. He published several essays, reviews, and addresses, and an *Inquiry into the Nature and Character of our Federal Government* (1840).

Upsilonism: See CZECH LITERATURE.

Upson, ANSON JUDD, D. D., LL. D.: educator; b. in Philadelphia, Pa., Nov. 7, 1823; A. B., Hamilton College, 1843; A. M. 1846; D. D. 1870; LL. D., Union, 1880; tutor, Hamilton College 1845–49; Adjunct Professor of Rhetoric and Moral Philosophy 1849–53; Professor of Logic and Rhetoric 1853–70; Professor of Sacred Rhetoric and Pastoral Theology, Auburn Theological Seminary, 1880–87; professor emeritus since 1887; ordained to the ministry (Presbyterian) Jan. 29, 1868, at Rome, N. Y.; pastor Second Presbyterian Church, Albany, N. Y., 1870–80; trustee Hamilton College 1872–74; regent University of the State of New York 1874; elected vice-chancellor of the University of the State of New York 1890, and chancellor 1892; member Presbyterian General Assembly 1871, 1877, 1884; delegate to Evangelical Alliance, Belfast, Ireland, 1884; author of numerous educational and collegiate addresses, sermons, and articles in periodicals. C. H. THURBER.

Upton: town (incorporated in 1735); Worcester co., Mass.; on the Grafton and Upton Railroad; 13 miles S. E. of Worcester, and 33 miles W. S. W. of Boston (for location, see map of Massachusetts, ref. 3–G). It contains the villages of Upton Centre and West Upton; has Congregational, Unitarian, Methodist Episcopal, and Roman Catholic churches, high school, seven public schools, and a public library; and is principally engaged in the manufacture of straw hats. Pop. (1880) 2,023; (1890) 1,878; (1900) 1,937.

Upton, EMORY: soldier; b. at Batavia, N. Y., Aug. 27, 1839; graduated at the U. S. Military Academy, May, 1861, and commissioned second lieutenant of artillery; served in the Manassas campaign, engaged in the battles of Blackburn Ford and Bull Run, where he was wounded. In the Peninsular campaign of 1862 he commanded his battery at Yorktown, Gaines's Mill, and Glendale; in command of artillery brigade at South Mountain and Antietam; appointed colonel 121st New York Volunteers, Oct., 1862, and engaged at Fredericksburg, Salem Heights, Gettysburg, and was in command of a brigade during the subsequent Rapidan campaign. In the Richmond campaign of 1864 he led his brigade (Sixth Corps) through the Wilderness battles to the front of Petersburg, particularly distinguishing himself at Spottsylvania Court-house; transferred with his corps to the Shenandoah July, 1864, he was wounded at Opequan Sept. 19, while in command of a division. Returning to duty in December, he was assigned to a division of cavalry in the West, and was engaged in the expedition into Alabama and Georgia in the spring of 1865 resulting in the capture of Selma, Columbus, etc. Mustered out of the volunteer service Apr., 1866, he was in July transferred to the Twenty-fifth Infantry with rank of lieutenant-colonel, and engaged in perfecting a *System of Infantry Tactics*, which was adopted in Aug., 1867, for the use of the army and militia of the U. S. He was transferred to the Eighteenth Infantry in 1869, and to the First Artillery 1870; was commandant of cadets at West Point 1870–75; on professional duty in Asia and Europe 1875–77; commanded several artillery posts, and was on the board to codify army regulations 1878–81. He received the brevets from major to major-general in the U. S. army. D. in San Francisco, Cal., Mar. 15, 1881. See his *Life and Letters*, by Prof. P. S. Michie (New York, 1885). Revised by JAMES MERCUR.

Upton, GEORGE PUTNAM: journalist and musicographer; b. at Roxbury, Mass., Oct. 25, 1834; educated at Brown University, Providence, R. I., graduating in 1854; went to Chicago and entered upon a journalistic career. In 1862 he became connected with *The Chicago Tribune*, and was its music critic until 1882. He has published *Women in Music* (1882); *The Standard Operas* (1885); *The Standard Oratorios* (1886); *The Standard Cantatas* (1887); *The Standard Symphonies* (1888); and has translated several of Mohl's *Lives of Eminent Musicians*, all of which were published in Chicago. D. E. H.

Upup'idæ [Mod. Lat., named from *Upupa*, the typical genus, from Lat. *u'pupa*, hoopoe; cf. Gr. ἔποψ]: a family of birds typified by the common hoopoe of Europe, characterized by a desmognathous palate, perforate episternal process, pointed manubrium, and spinal feather-tract forked on the upper back. The singing apparatus is lacking. On account of its peculiarities the family is considered as representing a distinct sub-order, having its nearest relations with the hornbills. See HOOPOE. F. A. L.

Urabá, Gulf of: See DARIEN, GULF OF.

Uræ'mia: a condition resulting from the imperfect action of the kidneys, whereby substances which would normally be excreted are retained in the blood. It occurs especially in cases of Bright's disease; the symptoms are headache, convulsions, delirium, nausea, etc.

Uraga, oo-raang'ăa: a port of Japan; at the western entrance to the Bay of Tokio (see map of Japan, ref. 6–E). The town is built on both sides of a narrow fiord-like harbor, which are connected by a bridge and a ferry. Formerly all junks entering the bay were stopped for inspection here. Uraga is associated with the opening up of the empire, for it was here that Commodore Perry cast anchor July 8, 1853, when sent by President Fillmore with a letter for the emperor. The place has daily steam communication with the capital, the journey taking four hours; and is noted for the production of *midzu-ame*, a sweetmeat resembling barley-sugar. It is a minor naval dépôt and has a naval gunnery school. Pop. (1895) 12,719. J. M. DIXON.

Ural: river of Russia, which rises in the Ural Mountains, flows S., forming the boundary between Europe and Asia, and enters the Caspian Sea after a course of 930 miles. It is not navigable on account of sandbanks, but is very rich in the finest kinds of fish, particularly near its mouth, where the Cossacks have important fisheries. Its delta is very large, and is still increasing.

Ural-Altaic Languages: See LANGUAGE.

Uralian Emerald: See GARNET.

Ural Mountains: a range of plateaus rising from 3,000 to 5,000 feet, and with a breadth of from 16 to 66 miles. They begin in the Arctic Ocean, in lat. 70° N., and stretch southward to lat. 50° N., forming the natural boundary between Europe and Asia. They are rich in gold, platinum, copper, iron, and other ores. Of precious stones, beryl, topaz, amethyst, and diamonds are found; coal is abundant. The Obdorsk Mountains branch off from the middle chain of the Ural Mountains in lat. 62° N., and extend 500 miles N. N. W. Revised by M. W. HARRINGTON.

Uralsk': province of Russia; at the southern end of the Ural Mountains, on the Ural river, and N. E. of the Caspian Sea (see map of Russia, ref. 7–I). It lies partly in Europe, but is essentially Asiatic, and is one of the provinces of the general government of the Kirghiz steppe. It is chiefly dry steppe and desert, and much of it is below sea-level. Area, 139,168 sq. miles. Pop. (1889) 559,552. The capital, Uralsk, is near the northern border, on the Ural river, is well built, and has a fine trade in fish, hides, tallow, grain, and imported goods. Pop. (1890) 26,034. M. W. H.

Ura'nia [= Lat. = Gr. Οὐρανία, liter., the Heavenly One, fem. of οὐράνιος, of the sky or heaven, deriv. of οὐρανός, sky, heaven]: in Grecian mythology, one of the nine Muses, the goddess of astronomy, and a daughter of Zeus and Mnemosyne. She was generally represented as holding a celestial globe in the one hand and pointing at it with the other.

Uranine: the sodium salt, $C_{20}H_{10}Na_2O_5$, of fluorescein. Its yellow solution exhibits the most wonderful fluorescence, which is instantly destroyed by acidulating it; for this reason it has been recommended as an indicator in volumetric analysis. See PHTHALIC ACID.

Uraninite, or **Pitchblende**: a pitch-black mineral with a specific gravity of 9·5. It is found at Joachimstal, Bohemia, in sufficient quantity for commercial purposes; also in Cornwall, England, and other localities. In addition to uranoso-uranic oxide (U_3O_8) it contains lead sulphide, silica, lime, etc., and from 1 to 2·5 per cent. of a gas which was first supposed to be nitrogen, but in 1895 was shown to be a mixture of the gases argon and helium.

Ura'nium [Mod. Lat., named from the planet *Uranus*]: a name given by Klaproth in 1789 to a metal whose oxide he discovered in the mineral called *pitchblende* (*uraninite* of Dana), which contains from 40 to 90 per cent. of the oxide U_3O_8. It was not until as late as 1840, however, that metallic uranium was first discovered by Peligot, what had previously passed for the metal having been ascertained by him to be the dioxide, UO_2. There are a large number of mineral species that contain uranium, but the only one occurring in sufficient quantity to be available for the extraction of uranic compounds is pitchblende. In the U. S. it is found as *coracite*, on the north side of Lake Superior, and as *autunite*, on the Schuylkill above Philadelphia.

To obtain uranium compounds from pitchblende it is ground and washed to remove impurities, roasted to remove sulphur and arsenic, and dissolved in nitric acid, evaporated then to dryness, which decomposes the ferric nitrate. Water dissolves from the dried mass little but the pure uranic nitrate, which is further purified by crystallization, and several recrystallizations when required perfectly pure. From this salt the pure oxide, U_3O_8, may be obtained by ignition alone, and the dioxide, UO_2, by ignition with reducing agents, and the tetrachloride, UCl_4, by heating with charcoal in chlorine gas. The metal was obtained by Peligot from the tetrachloride by heating with metallic potassium or sodium. It is hard, but somewhat malleable, and can be scratched by a file. The maximum density was 18·68; the color approached that of iron. It tarnishes to a yellowish color in air. It takes fire, when in powder, at a temperature of about 500° F., burning brightly to U_3O_8, of a dark-green color. It does not decompose water in the cold, but evolves hydrogen with dilute acids, dissolving with a green color. It combines directly with sulphur and chlorine. *Uranium nitrate*, or *uranyl nitrate*, is one of the commonest commercial compounds of uranium. In the usual method of preparation of uranium oxide from pitchblende, the uranium is first obtained as this nitrate, which has the formula $UO_2(NO_3)_2$. *Sodium uranate*, $Na_2U_2O_7$, is a fine yellow powder which is manufactured on a large scale and sold under the name *uranium yellow*, as a pigment for glass, etc. *Ammonium uranate*, $(NH_4)_2U_2O_7$, is also manufactured on a large scale. Uranium compounds impart to glass a greenish-yellow fluorescent color. Revised by IRA REMSEN.

Uranium or **Becquerel Rays**: See the Appendix.

U'ranus [= Lat. = Gr. Οὐρανός, liter., sky, heaven]: in Grecian mythology, the son of Gaia, the earth, and by her the father of the Titans, Cyclopes, Hundred-handed, etc. He hated his children, and confined them in Tartarus, but on the instigation of Gaia, Cronus, the youngest of them, overthrew and dethroned him. See GAIA and ZEUS.

Uranus [= Mod. Lat., named from the Greek deity *Uranus* = οὐρανός, heaven]: the seventh planet in order of distance from the sun, and, with the exception of Neptune alone, the outermost member of the planetary family. Uranus travels at a mean distance of 1,753,869,000 miles from the sun, but, its orbit being considerably eccentric, its greatest distance, 1,835,561,000 miles, exceeds its least distance, 1,672,177,000 miles, by nearly 163,400,000 miles, or not much less (relatively) than the entire span of the earth's orbit. Since the earth's mean distance from the sun is 91,430,000 miles, the opposition distance of Uranus varies from about 1,744,100,000 miles to about 1,581,700,000 miles; and as the planet is farther from the sun in the former than in the latter case, and therefore less brightly illuminated, there arises a considerable variation in the apparent brightness of Uranus. In fact, Uranus is more favorably situated for telescopic study when in opposition near perihelion than when in opposition near aphelion, in the proportion of $(17,441)^2 \times (18,356)^2 : (15,817)^2 \times (16,723)^2$, or nearly as 3 to 2 (more exactly as 63 to 43). The eccentricity of the orbit of Uranus is 0·0466. The planet completes a sidereal revolution in 30686·8208 days, or in 84 years and 6·5 days. Its synodical period is 369·656 days, exceeding a year by little more than four days. The inclination of the orbit to the ecliptic is about 46·5′. The mean diameter of Uranus is estimated at about 33,000 miles; the compression of the globe is not known. Its volume exceeds the earth's about seventy-four times, but its mean density is so small (0·17—the earth's as 1) that its mass exceeds that of the earth only about twelve and a half times. It has been said that Uranus rotates on its axis in nine and a half hours, but no reliance can be placed on the assertion, as the most powerful telescopes fail to show any clearly defined markings on this distant globe. Uranus was discovered by Sir William Herschel Mar. 13, 1781, when he was examining the small stars in the neighborhood of η Geminorum. He was led by the apparent size of a star in this region to suspect that it was a faint comet. Examining the object with higher powers, and finding its disk enlarged (which would not have been the case with a fixed star), he was confirmed in this suspicion. But soon after the discovery had been announced the mathematicians who had undertaken the calculation of the stranger's orbit found the path to be an ellipse of moderate eccentricity, and concluded that the new orb was a member of the planetary family. This was placed beyond doubt before long; and in 1787 two satellites were discovered whose motions indicated that the supposed comet had a mass many times exceeding that of our earth. Herschel proposed to call the new planet Georgium Sidus, in honor of George III. Continental astronomers for a long time called it Herschel, but the name Uranus, suggested by Bode, of Berlin, is now universally adopted by astronomers.

Satellites of Uranus.—Uranus is attended by four satellites. The two brighter ones were discovered by Sir William Herschel, who afterward thought that he had discovered four more, so that until the middle of the nineteenth century Uranus was considered to have six satellites in all. But Lassell, of England, in pointing his great reflectors on Uranus, announced that these four additional satellites had no existence, but that two very minute ones circulated between Uranus and the bright ones. It is now established that Uranus has these four satellites, and no others have so far been discovered. Their times of revolution are shown in the following table:

ELEMENTS OF URANUS'S SATELLITES.

NAME.	Sidereal revolution.	Mean distance in radii of Uranus.
	d. h. m.	
Ariel	2 12 28	7·44
Umbriel	4 3 27	10·37
Titania	8 16 55	17·01
Oberon	13 11 6	22·75

Revised by S. NEWCOMB.

Urari: another spelling for CURARI (*q. v.*).

Ura'shima Taro: in Japanese folk-lore, a legendary personage, incidents in whose story furnish frequent themes for art treatment. He is the Rip Van Winkle of Japan. A fisherboy, he was caught in a storm and rescued by a goddess who rode upon a large tortoise. Mounting beside her, he descended to the bottom of the sea, and was royally entertained in a magnificent palace. After seven days he wished to return, and his request was granted. But he found that he had been centuries away. The story is told at length in Griffis, *The Mikado's Empire*, and in Chamberlain, *Classical Poetry of Japan*. J. M. DIXON.

U'rates, or **Lithates** [*urates* is deriv. of *uric*; see URIC ACID; *lithates* is deriv. of *lithic*, deriv. of *lithium*; see LITHIUM]: compounds of uric acid with bases. Both neutral and acid urates of most metals are known. They are sparingly soluble in water, but dissolve in warm alkaline solutions and in solution of borax. The acid ammonium, sodium, and calcium urates are frequent ingredients of URINARY CALCULI AND DEPOSITS (*q. v.*), the proportion of the calcium salt, however, being very small. The lithium is the most soluble of the urates; for this reason lithia-water is sometimes used as

a remedy for gout and for superabundance of uric acid in the system. Ammonium urate is occasionally applied medicinally, in chronic cutaneous affections, in the form of an ointment; but urates should be taken internally very cautiously, as they may give rise to the formation of oxalic acid in the urine. Revised by IRA REMSEN.

Urban (Lat. *Urbanus*): the name of eight popes. (1) URBAN I. (about 222–230), son of Pontianus, a Roman noble; a martyr, according to somewhat doubtful authority.—(2) URBAN II., Othon de Lagny (1088–99); b. at Châtillon-sur-Marne, in France, about 1042; was successively a disciple of St. Bruno, canon of Rheims, and monk of Cluny, where Gregory VII. made his acquaintance. This pope invited him to Rome, made him cardinal and Bishop of Ostia, employed him as his legate in Germany, and on his death-bed named him among those worthy of the succession, which in fact became his after the short reign of Victor III. (1086–87). The main object of Urban's life was the continuation of the policy of Gregory VII. against the lay investitures, simony, and priestly concubinage. Henry IV. and the anti-pope Guibert of Ravenna (Clement III.) maintained for a long time possession of all or part of the city of Rome, and much of Urban's life was spent outside the city. In the eleven years of his pontificate he bore up manfully against the emperor, helped in turn by the rebellion of the latter's son Conrad, by the marriage of the Countess Mathilda to Welf, the son of the Duke of Bavaria, by King Roger of Sicily, and by the first crusaders. (See CRUSADE and PETER THE HERMIT.) Urban held a number of councils in Southern Italy for the reformation of manners and the maintenance of the independence of the holy see, notably that of Bari, at which St. Anselm of Canterbury assisted and aided in the refutation of the Greek arguments against the Latin doctrine concerning the procession of the Holy Ghost from the Father and the Son. Urban died in Rome, July 29, 1099, fourteen days after the capture of Jerusalem.—URBAN III., Umberto Crivelli (1185–87), a native of Milan. His short and stormy pontificate is chiefly noted for the struggle with Frederick Barbarossa, whom he was about to excommunicate when death surprised him at Ferrara, Oct. 20, 1187.—URBAN IV., Jacques Pantaléon (1261–64), a Frenchman; son of a shoemaker; became canon of Liège, Bishop of Verdun, and Patriarch of Jerusalem. He carried on the long papal struggle against the Hohenstaufen in Southern Italy and Sicily, and made over these possessions to the house of Anjou, by inviting Charles of Anjou to take the place of the untractable King Manfred. Urban endeavored to bring about the union of the Latin and Greek Churches; he also established for all Christendom the feast of Corpus Christi, first celebrated at Orvieto, June 19, 1264. Urban died at Orvieto, Oct. 2, 1264.—URBAN V., Guillaume Grimoard (1362–70); a Benedictine monk; distinguished professor of canon law and Scripture; abbot of St. Victor at Marseilles, and papal legate. Yielding to the necessities of the situation and to the entreaties of such persons as Petrarch and St. Bridget of Sweden, he returned from Avignon to Rome Oct. 16, 1367, and ended the long exile of the popes. But his passionate love for France drew him back again to Avignon, where he died Dec. 16, 1370. He was a mild-mannered, studious man, the friend of scholars, and founder of a school of medicine at Montpellier.—URBAN VI., Bartolommeo Prignani (1378–89); Archbishop of Bari; elected Apr. 8, 1378, to succeed Gregory XI., a Frenchman, who, it is said, had been meditating a return to Avignon. Shortly after his election the French cardinals, dissatisfied with his zeal and somewhat harsh manners, took flight to Anagni, and there elected anti-pope Cardinal Robert of Geneva (Clement VII., 1378–94). They claimed that the Roman people had forced them by violence to elect Urban, but it is sure that they assisted at his authorization, at his consistories, and asked favors from him. Thus the papacy was divided, and the great schism of the West inaugurated, which filled all Christendom with woe. The hasty, impetuous temperament of Urban did not aid matters; his latter days were embittered by the ill success of his plans in the kingdom of Naples and by the conspiracy of his own cardinals, who tried to create a kind of tutorship for him, but paid for it with death or imprisonment. D. in Rome, Oct. 15, 1389.—URBAN VII., John Baptist Castagna (1590); Archbishop of Rossano, cardinal, and legate to Spain; d. after a reign of thirteen days Sept. 28, 1590.—URBAN VIII., Maffeo Barberini (1623–44); built the Collegium Urbanum, or College of the Propaganda; established the Vatican Seminary; gave its final shape to the bull *In Cœna Domini*; increased and strengthened the fortifications of Rome; gave to the cardinals the title of eminence; regulated the number of feasts of obligation; inherited the state of Urbino by extinction of the Della Rovere family; issued an emendated breviary, in which the ancient Christian style in the hymns was replaced by classic exactness of metre. He has been accused of excessive nepotism, and of furtherance of French interests in the Thirty Years' war. To his pontificate belongs also the condemnation of Galileo by the Congregation of the Holy Office. See *Les pièces du procès de Galileo*, by H. de l'Épinois (Paris, 1877), and Ward, *Copernicanism and Pope Paul V.* (*Dublin Review*, 1871). D. in Rome, July 29, 1644. Urban was a man of polished manners and literary tastes, and was personally gentle and refined. JOHN J. KEANE.

Urban'a: city; capital of Champaign co., Ill.; on the Cleve., Cin., Chi. and St. L., the Ill. Cent., and the Wabash railways; 31 miles W. of Danville, and 50 miles E. S. E. of Bloomington (for location, see map of Illinois, ref. 6–F). It is in an agricultural and mineral region; is the seat of the University of Illinois; and has a national bank (capital $50,000), a private bank, and a weekly paper. Pop. (1890) 3,511; (1900) 5,728. EDITOR OF "CHAMPAIGN COUNTY HERALD."

Urbana: city; capital of Champaign co., O.; on the Cleve., Cin., Chi. and St. L., the Erie, and the Pitts., Cin., Chi., and St. L. railways; 46 miles W. of Columbus, and 100 miles N. of Cincinnati (for location, see map of Ohio, ref. 5–D). It is in an agricultural region, and is the seat of Urbana University (New Church, chartered in 1850). It contains a high-school building that cost $125,000, a public library, a soldiers' monument in the center of Monument Square, 3 national banks with combined capital of $300,000, 5 building and loan associations, and a daily and 3 weekly papers. The business interests include the shops of the U. S. Rolling Stock Company, machine-works, agricultural-implement works, tannery, carriage and wagon shops, stove-foundry, woolen-mill, water-wheel works, and straw-board, furniture and table, broom, and shoe factories. Pop. (1890) 6,510; (1900) 6,808. EDITOR OF "TIMES-CITIZEN."

Urbi'no (anc. *Urbinum Hortense*): an old town in the province of Urbino, Italy; on two steep and lofty hills of the Umbrian chain, between the Metauro and the Foglia; about 25 miles S. W. of Pesaro (see map of Italy, ref. 4–E). The walls were erected by the celebrated mathematician Federigo Commandini, and the town was afterward further strengthened with a castle and towers by the lords of Montefeltro (1213). The large cathedral is of the seventeenth century, the ancient church on this site having been destroyed by an earthquake. The ducal palace (begun 1447) is a noble edifice in the early Renaissance style, and, besides much striking mediæval ornament, contains ancient inscriptions and bas-reliefs of great interest. Several of the private palaces possess rare artistic treasures, especially that of the Staccoli Castracane, where there is a fine collection of the famous ceramics of Urbino, Casteldurante, and Gubbio. The modest house in which the painter Raphael Sanzio was born (1483) is now used as a town museum. There is a free university, founded in 1564. Urbino is among the most ancient cities of Italy, acquired the rights of Roman citizenship in 89 B. C., and suffered many vicissitudes during the breaking up of the Roman empire. It recovered some importance in the early part of the thirteenth century, but the first who assumed the title of Duke of Urbino was Federico di Montefeltro (1474), and he and his immediate successors, as wise and virtuous as they were prosperous, made Urbino famous in the history of the mediæval world. In 1508 the duchy passed to the Della Rovere house; in 1631 it became the direct property of the Church, and so remained, with the brief exception of the French domination, till united to the kingdom of Italy. Urbino is distinguished for the number of remarkable men to whom it has given birth, and for the general intelligence and activity of its citizens. Both agricultural and manufacturing industries are flourishing. Pop., with the commune, 17,230.
Revised by M. W. HARRINGTON.

Urchin-fish, or **Porcupine-fish**: See DIODON.

Ure, yur, ANDREW, M. D., F. R. S.: chemist; b. in Glasgow, Scotland, May 17, 1778; educated at the Universities of Glasgow and Edinburgh, where he also graduated in medicine; became Professor of Chemistry at the Andersonian Institution at Glasgow 1804, and director of the Glasgow Observatory 1809; removed to London 1830; was appointed

analytical chemist to the board of customs 1834; and successfully applied chemical discoveries to the arts and to manufactures. He was the author of *A New Systematic Table of the Materia Medica* (1813); *A Dictionary of Chemistry* (2 vols., 1821; republished in the U. S. by Dr. Robert Hare and Dr. Franklin Bache, Philadelphia, 1821)—a work which was the undisputed standard for several years; *A New System of Geology* (1829); *The Philosophy of Manufactures* (1835); *The Cotton Manufacture of Great Britain* (2 vols., 1836; new ed. 1861); and *A Dictionary of Arts, Manufactures, and Mines* (1837), which was rewritten and enlarged by Dr. Robert Hunt (3 vols., 1859–60; 7th ed., 4 vols., 1875–78). D. in London, Jan. 2, 1857.

U'rea [Mod. Lat., from Gr. οὖρον, urine; cf. URINE, etc.]: an isomer of ammonium cyanate, first obtained by Rouelle in 1773, afterward in a state of greater purity by Fourcroy and Vauquelin in 1799. It is an essential constituent of the urine of mammiferous animals, particularly of the Carnivora, but is also found in that of birds and of Amphibia. Urea also occurs, to some extent, in human blood and perspiration, in the vitreous humor of the eye, and in the lymph and chyle of various animals. It is the chief outlet for the oxidized nitrogen of the tissues of the system, a healthy adult excreting more than an ounce daily. It is not formed in the kidneys, which appear merely to separate it from the blood in which it is pre-existent. Urea may be formed artificially in several ways, but its preparation by the action of cyanic acid on ammonia (discovered by Wöhler in 1828) possesses special interest as being the first synthetic formation of an organic compound:

$$\underset{\text{Ammonium cyanate.}}{H_4N.CNO} = \underset{\text{Urea.}}{CH_4N_2O}.$$

It is also obtained from cyanamide (CN_2H_2) by the addition of one equivalent of water, and by the decomposition of numerous complex organic compounds, such as creatin, guanin, and URIC ACID (*q. v.*); likewise by the action of carbonyl chloride ($COCl_2$) on ammonia; but in the laboratory it is usually prepared either from urine or by the evaporation of a solution of ammonium cyanate. In the former process the urine is evaporated to dryness on the water-bath, and the residual mass exhausted with alcohol, which is evaporated to dryness. The second residue is then extracted with pure alcohol, which, upon evaporation, leaves the urea in a slightly colored state. In another method the urine is concentrated by evaporation, and nitric or oxalic acid added, by which a precipitate of urea nitrate or oxalate is formed, from which the urea is obtained by decomposition with barium or calcium carbonate, filtering the solution, and purifying the urea by repeated recrystallization from alcohol. Urea is, however, most readily and abundantly prepared from ammonium cyanate in the following manner: Potassium cyanate is first formed by heating a mixture of 56 parts of carefully dried potassium ferrocyanide and 28 parts of dry manganese dioxide to dull redness. The residue, when cold, is treated with cold water, and 41 parts of ammonium sulphate are added, when ammonium cyanate and potassium sulphate are formed. The solution is then evaporated, and treated with hot alcohol, from which, on cooling, the urea crystallizes out.

Urea crystallizes in colorless striated prisms, which fuse at 248° F., but are decomposed at a higher temperature. Its specific gravity is 1·30. It is very soluble in water and in hot alcohol, but is nearly insoluble in ether. Its solution possesses a neutral reaction and a cooling bitter taste. When heated in a sealed tube to about 284° F., urea combines with two molecules of water, and is converted into ammonium carbonate, $CH_4N_2O + 2H_2O = (H_4N)_2CO_3$. The same change takes place when urine is exposed to the air, owing to the action of micrococci (*micrococcus ureæ*). It is to the formation of ammonium carbonate that the alkaline reaction of stale urine is due. When it is heated above its melting-point, *biuret* ($C_2O_2H_5N_3$) and *cyanuric acid* ($C_3O_3H_3N_3$) are formed, with evolution of ammonia. Urea combines with acids, forming crystalline compounds, and also with metallic oxides, such as those of mercury and silver. Numerous substitution-derivatives of urea (*compound ureas*) have also been obtained. For the quantitative estimation of urea in urine, see URINE. Revised by IRA REMSEN.

Uredin'eæ, or **Uredines** [Mod. Lat., named from *Ure'do* (a form or stage of development of the Uredineæ, and formerly considered a genus), from Lat. *ure'do*, burning, blast, blight, deriv. of *u'rere*, burn]: an order of minute parasitic fungi popularly known as the RUSTS (*q. v.*). They consist of branching colorless threads which penetrate the tissues of their hosts (flowering plants or, rarely, ferns), eventually producing their characteristic rust-colored spores. About 1,500 species are known to botanists, all falling within the family *Uredinaceæ*, and divided among about a dozen genera, the more important of which are *Uromyces*, *Puccinia*, *Gymnosporangium*, and *Phragmidium*. C. E. BESSEY.

Ure'ter [Mod. Lat., from Gr. οὐρητήρ, urethra, ureter, deriv. of οὐρεῖν, urinate. See URETHRA]: the excretory duct of the kidney. In man it is a cylindrical membranous tube about 17 inches long, and as large as a goosequill, passing from the pelvis of the kidney to the base of the bladder. It has a fibrous (or outer), a muscular, and a mucous (or inner) coat. Each kidney normally has a distinct ureter.

Ure'thra [Mod. Lat., from Gr. οὐρήθρα, the passage for urine, deriv. of οὐρεῖν, urinate, deriv. of οὖρον, urine]: the name of the membranous canal by which the urine is emptied from the bladder. In the female it is but a short passage opening below the clitoris. In the male it is a canal of about 8 to 9 inches in length, and of a somewhat complicated structure, conducting not only the urine, but also the semen. Going from the bladder outward, the urethra is divided into three parts: (1) the prostatic part, surrounded by the prostate gland, in which (part) are the openings of the seminal ducts; (2) the membranaceous part, 8 to 10 lines long; and (3) the cavernous or spongy part, surrounded by the spongy tissues of the penis. The caliber of the urethral canal is different in the different parts and different individuals, and ranges from 3 to 7 lines in diameter, the orifice being the narrowest part. The urethra is lined throughout with a delicate coating of mucous membrane, which is a direct continuation of that of the bladder. For obstructions of the urethra, see STRICTURE. Revised by W. PEPPER.

Urfah: See ORFA.

Urga [palace], the Russian name of the Mongolian **Bogdo-Kuren** or **Da-Kuren** [holy camp]: the capital of Northern Mongolia; on the Tola, in lat. 47° 58′ N., lon. 106¾° E., at an elevation of 4,370 feet, between Kiachta and Peking, on the principal caravan route between Russia and China (see map of Asia, ref. 3–G). Urga consists, like all Mongolian towns, of a Mongolian and a Chinese quarter. The latter, which contains the fort, is also called *Mai-mai-chin* (trading-place), and stands 2½ miles from Bogdo-Kuren. Bogdo-Kuren contains large Buddhist monasteries and temples, and is the seat of the supreme Mongolian Kutukhtu, who is considered the terrestrial representative of Buddha, and ranks in holiness next to the Dalai lama of Lhassa and the Panchen Rinpoche of Shigatse, both in Tibet. The monasteries are extensive structures of stone, and contain numerous shrines and relics, which are subjects of the deepest veneration; the occupants, the monks, are called *lama*, and number about 10,000. The custom is not to bury the dead, but to leave them, in accordance with Buddhistic doctrines, to be devoured by the dogs and birds of prey; only those of priests and princes are interred. The Mongols settled here belong to the Khalka tribe. During summer, numerous pilgrims from all parts of Mongolia gather to the city, and a brisk trade springs up. The unit of value was formerly the tea-brick, but this has given way to Chinese cash. Tea, mixed with cows' blood, was moulded into the form of bricks, and from twelve to fifteen such bricks were paid for a sheep, or from 120 to 150 for a camel. The surrounding country has a South Siberian character; the mean temperature of the year is 25·70° F.; the number of rainy or snowy days is forty-one. A Russian consul is stationed here, with a small detachment of Cossacks for his protection. Russian merchants and scholars often visit Urga, and undertake from here extensive journeys into Northern Mongolia. Pop. about 30,000. Revised by M. W. HARRINGTON.

Uri: one of the forest cantons of Switzerland, bordering N. on Lake Lucerne, and having St. Gothard on its southern frontier. Area, 415 sq. miles. It consists of one valley, inclosed by lofty mountains and traversed by the Reuss. Rearing cattle and dairy-farming are the principal employments. Pop. (1900) 19,701, who are Roman Catholics and speak German. Chief town, Altorf. It was one of the three original cantons of Switzerland. M. W. H.

Uria, or **Hyria**: an inland city of ancient Calabria, in Southern Italy; situated on the Appian Road, about midway between Brundusium and Tarentum. Herodotus represents it as having been the metropolis of the Messapians, founded by a colony of Cretans on their return from Sicily.

Uric Acid, or **Lithic Acid** [*uric* is from Gr. οὖρον, urine; *lithic*, i. e. pertaining to the formation of stone or uric acid concretions in the bladder, etc., is from Gr. λιθικός, of a stone or stones, deriv. of λίθος, stone]: a substance first discovered by Scheele in 1776, and subsequently more thoroughly investigated by Wöhler and Liebig in 1838; formula, $C_5N_4H_4O_3$. Later Adolf Bäyer gave attention to the uric group of compounds; and Emil Fischer finally solved the problem of the chemical constitution of uric acid. Uric acid occurs in a small proportion in human urine, but is much more abundantly contained in the excretions of insects, land-reptiles, and birds, usually as the ammonic salt. It is extensively found in the guano-beds of the Pacific islands, also in the form of ammonium urate, and is said to be contained in the human spleen, liver, and lungs; also in the blood, which latter, in certain diseases, as gout, contains a very considerable amount; indeed, in persons suffering from gout it often accumulates around the joints, forming what are commonly but incorrectly termed "chalk-stones," which consist chiefly of sodium urate. When secreted in excess, it is discharged by the kidneys, and is deposited from the urine as *red gravel*, or it accumulates in the bladder and forms a constituent of URINARY CALCULI (*q. v.*).

Uric acid is most advantageously prepared from the dried urine of serpents, by dissolving the powdered mass in a large quantity of boiling water, to which caustic potash enough to dissolve all the acid is added, and heating until ammoniacal vapors cease. The fluid is then filtered, and the potassium urate decomposed by hydrochloric acid, uric acid appearing in minute white crystals. It can also be obtained by boiling guano with a weak borax solution, whereby a solution of sodium urate is formed, from which the uric acid is precipitated by hydrochloric acid. Uric acid crystallizes in small white rhombic prisms; but if slowly deposited from a dilute solution, it frequently separates in large crystals containing two molecules of water; when obtained from animal fluids, its crystalline form is often very much modified. It is almost insoluble in water, requiring 10,000 parts of cold water, and is quite insoluble in alcohol and in ether. It dissolves in concentrated sulphuric acid, from which it is precipitated in a hydrated form by the addition of water. When dry uric acid is heated, it is decomposed without fusion, and hydrocyanic acid is evolved, a sublimate, consisting of cyanuric acid, urea, with ammonium cyanate and carbonate, being formed.

The most remarkable property of uric acid is the facility with which it is altered by oxidizing agents, such as nitric acid, plumbic dioxide, etc., and transformed into numerous well-defined crystalline compounds, some of which, however, are obtained from the immediate products of oxidation by the action of reducing agents, acids, and alkalies. More than thirty of these compounds (many of which are termed *ureides*) have been prepared, including the following: *alloxan*, *alloxantin*, *uramil*, *allantoin*, *glycoluril*, *murexide*; also the acids *uroxanic*, *barbituric*, *bioluric*, *thionuric*, *oxaluric*, *parabanic*, and *mesoxalic*. Uric acid has been synthetically produced.

Uric acid is dibasic, and forms both normal and acid salts. (See URATES.) Its presence can often be recognized with the aid of the microscope by its peculiar crystalline structure—rhombic tablets, frequently associated with dumb-bell-shaped crystals. When moistened with nitric acid and gently heated, a residue is obtained, which, upon treatment with ammonia, assumes a fine violet-red color (*murexide*), and when treated with potassium hydroxide acquires a violet-blue color (*potassium purpurate*). It may also be detected by dissolving in sodium carbonate, and placing a drop of the solution on paper moistened with silver nitrate, upon which it produces a brown spot, caused by the reduction of the silver. (For the quantitative estimation of uric acid in urine, see URINE.) One of the uric acid series (*murexide*) was formerly used in cotton-dyeing. Revised by IRA REMSEN.

Urim and Thummim [*U'rim* = Heb. *ūrīm*, plur. of *ūr*, flame, fire; cf. *ōr*, light; *Thum'mim* is from Heb. *tummīm*, plur. of *tōm*, perfection, truth, deriv. of *tāmam*, be perfect]: sacred symbols of the high priest of Israel given at Sinai (Ex. xxviii. 30), but lost forever at the destruction of the first temple (Ez. ii. 63; Neh. vii. 65). They were two objects placed in a pocket behind the breastplate of the high priest, and used to cast lots or to receive answers to questions and thus determine the divine will. It is not known just how the divine will was learned. In the Septuagint translation of 1 Sam. xiv. 41 the following description of their use occurs, and this is the clearest knowledge we have: "And Saul said, Lord God of Israel, why hast thou not answered thy servant to-day? If I or Jonathan my son has sinned, then Lord God of Israel give 'light'; but if it be thy people Israel who have sinned, then give 'right.'" The questions to be answered by the Urim and Thummim were public and not private, and only the high priest could use them. Revised by S. M. JACKSON.

Urinary Calculi and Deposits: Urine in disease often deposits on standing various kinds of sediments, which differ in properties and composition according to the causes which induce their formation. Both morphological and chemical bodies are thus separated. The former class includes such substances as blood, pus, epithelial cells, etc.; to the latter class belong urates, uric acid, phosphates, calcic oxalates and carbonates, hippuric acid, cystin, leucin, xanthin, tyrosin, etc. Perhaps the most common urinary sediment is that known as *lateritious* or *brick-dust deposit*. It occurs in health when active perspiration or free movement of the bowels renders the urine concentrated. It is a constant symptom in conditions of excessive urinary acidity as in gout. As a rule, the deposit occurs when the urine cools, and it may be redissolved by heat. In cases of disease, however, the urates and also uric acid may be present as deposit in the urine at the moment it is voided. If small masses are voided they are spoken of as gravel; if larger masses, as calculi or stones. Uric acid and urate stones are especially prone to form in the pelvis of the kidney. They are red in color, and fuse on platinum foil without leaving a residue. The same conditions which occasion urates in the urine frequently cause calcium oxalate also to appear. The latter may be due likewise to certain vegetables and fruits rich in oxalates, and is then less significant. Oxalate calculi are usually formed in the pelvis of the kidney; they are generally tuberculated, or of a mulberry appearance, and on fusing them a residue of calcium carbonate remains on the foil. Phosphates may appear in the urine as a whitish sediment, or, when ammoniacal decomposition has taken place, triple phosphates (ammonium-magnesium phosphate). These may cause the white or mixed phosphatic calculi in the bladder. They fuse in the blowpipe and are soluble in acids. Other calculi are rare, such as those composed of xanthin, cystin, calcium carbonate, and others.

Calculi are liable to cause serious obstructions to the flow of urine, and also severe inflammatory conditions of the pelvis of the kidney and of the bladder, where they most commonly occur. It is to be remarked, however, that the inflammatory conditions may in the first place cause the calculi by favoring the deposit of the urinary salts, and that the calculi afterward aggravate the original trouble.

Once formed, medication probably has no power to dissolve calculi. Occasionally they break spontaneously, and are discharged as fragments. Their formation is often preventable by careful medication, the use of waters, and care in diet, exercise, etc. Their removal when necessary involves cutting, crushing, and other operations. See LITHOTOMY. WILLIAM PEPPER.

Urinary Organs: See KIDNEY and HISTOLOGY.

Urine [viâ O. Fr. from Lat. *uri'na*, urine; cf. Gr. οὖρον, urine: Sanskr. *vār*, water: Icel. *ūr*, drizzling rain]: an excrementitious fluid excreted by the kidneys. Urine in health possesses a light amber color, a slight acid reaction, a peculiar odor, and a bitter saline taste. During the process of digestion it sometimes acquires an alkaline reaction. It has a sp. gr. of 1·024, but this also changes with the diet and state of health of the individual. It becomes more strongly alkaline on standing, owing to ammoniacal decomposition. (See UREA.) The urine excreted in the morning has a different composition from that passed in the evening, which has absorbed various substances taken into the stomach during the day. An average sample of healthy human urine has the following composition:

In 1,000 parts, water = 956·80 parts.
In 100 parts of solid matter:

Organic matters..	Urea	33·00
	Uric acid	0·86
	Alcoholic extract	29·03
	Aqueous "	5·80
	Vesical mucus	0·37
Fixed salts	Sodium chloride	16·73
	Phosphoric pentoxide	4·91
	Sulphuric trioxide	3·94
	Lime	0·49
	Magnesia	0·28
	Potash	4·47
	Soda	0·12

Besides the constituents named, the following compounds are occasionally contained in healthy urine, usually in minute quantities: Iron, ammonia, sugar, xanthin, creatin, creatinin, and lactic, succinic, oxalic, formic, phenylic, and hippuric acids. Free gases also occur: In 100 cubic cm. of urine, Plauer found 0·87 nitrogen, 0·06 oxygen, 4·54 free and 2·07 combined carbonic acid. Certain pigments, the composition of which is uncertain, are likewise present. There are a number of pigment matters in the urine, of which the most important is urobilin. Indigo-blue appears to be a product of the decomposition of other pigments, as it occurs in urine which has been exposed to the air for some time. Among the other bodies said to be contained in urine may be mentioned certain ferments and albuminoid matters, casein, leucin, tyrosin, taurin, acetone, and taurocholic, glycocholic, and cholic acids, which latter are present only in the abnormal or diseased excretion. The acidity of urine is due to the presence of acid sodium phosphates, and hippuric and other acids. Numerous substances appear to pass unchanged through the urine, such as many alkaline salts and numerous compounds of metals, alkaloids and organic acids, while others suffer a partial or complete transformation; thus malic acid is converted into succinic acid; sulphites and sulphides are changed into sulphates; tannic acid is converted into gallic acid; benzoic acid is transformed into hippuric acid; iodine changes to alkaline iodides; potassium ferrocyanide to the ferricyanide; and indigo-blue is reduced to indigo-white. In the disease diabetes a large amount of grape-sugar (glucose) is contained in the urine, owing to an incomplete digestion of the food, sometimes in the proportion of over a pound in the liquid voided during twenty-four hours. Small amounts of glucose occasionally appear in the urine in health or in persons not suffering with diabetes. In ALBUMINURIA (*q. v.*) a large quantity of albumin is secreted, the formation of which is due to a lack of secretive power on the part of the kidneys.

ANALYSIS OF URINE.—*Urea* may be determined in a variety of ways. *Liebig's volumetric method* is executed as follows: Dissolve 100 grammes of pure mercury in 500 grammes of nitric acid, evaporate to a sirup, add a little nitric acid, and dilute to 1,400 cubic cm.; this forms the standard mercury solution, 1 cubic cm. of which is equal to 1 centigramme of urea. Its strength should be actually determined by estimating a known weight of urea in the manner described further on. A baryta solution is next prepared by mixing 2 volumes of baryta-water and 1 volume of a solution of barium nitrate, both saturated in the cold; 15 cubic cm. of this baryta mixture is then added to 30 cubic cm. of the urine to be tested; the liquid is well stirred, and then filtered through dry paper; 15 cubic cm. of the filtrate (= 10 cubic cm. of the original urine) is then measured off in a beaker-glass, and the standard mercury solution is slowly added from a burette as long as any precipitation occurs, the precise end of the operation being determined by adding a drop of the mixture to a solution of sodium carbonate contained in a watch-glass, when a distinct yellow color should be produced. The number of cubic centimeters of the mercury solution used is read off, each cubic cm. indicating 1 centigramme of urea in the 10 cubic cm. of urine. In this method the presence of an excess of urea and of sodium chloride affects the accuracy of the result, and renders a correction of the figures obtained necessary. *Davey's method* consists in adding a small quantity of the urine to a graduated glass tube filled one-third with mercury, completely filling the tube with sodium hypochlorite, and immersing it in an inverted position in a concentrated solution of sodium chloride, in which position it is allowed to remain for several hours, after which the quantity of gas (nitrogen) evolved is read off: 1·549 cubic inches of nitrogen at 60° F. = 1 grain of urea. A modification of this method in which sodium hypobromite is used is more useful.

Uric acid is roughly determined by adding to about 200 cubic cm. of the urine 10 cubic cm. of hydrochloric acid, and allowing the mixture to stand for two days, when the precipitate formed is collected on a smaller filter, washed, dried, and weighed. Care should be taken not to use more than about 30 cubic cm. of water in washing the precipitate, as otherwise a partial solution of the uric acid is to be feared; and all albumin present should at first be removed by coagulation with dilute acetic acid, in which case this acid, in a concentrated form, should be employed as the precipitant of the uric acid.

Sugar (*glucose*) is estimated by its reducing action on a boiling cupric solution in presence of an alkali, or it can also be determined by adding a small quantity of yeast to the urine, and measuring the amount of carbonic acid formed by the fermentation of the sugar. *Albumin* is separated by heating the urine to boiling, and adding a few drops of nitric acid until complete coagulation takes place. *Chlorides* may be estimated by a volumetric method (as with silver and potassium dichromate solutions); *ammonia* by placing 20 cubic cm. of the urine in a shallow dish, over which is placed a similar vessel containing 10 cubic cm. of a standard solution of sulphuric acid; 10 cubic cm. of milk of lime is then added to the urine, and an air-tight bell-jar is placed over the whole. In two days the ammonia will have been absorbed by the acid, and is estimated by titrating and comparing the residual acidity with that of the standard acid. Revised by WILLIAM PEPPER.

Urine, Retention of: See RETENTION OF URINE.

Urinom'eter [*urine* + Gr. μέτρον, measure]: an instrument used in the determination of the specific gravity of URINE (*q. v.*). It consists merely of an ordinary hydrometer, in which the scale runs from 1,000 to the limits of density of urine, 1,060 or 1,070.

Urinous Fermentation: See FERMENTATION.

Urmia, or **Urumia**: town; in the province of Azerbijan, Persia (see map of Persia and Arabia, ref. 1–F); on an elevated plain 12 miles W. of Lake Urmia. It is well built, and is in a densely peopled and well-cultivated district, which by European travelers has often been compared with Lombardy. The Protestant mission has here a very prosperous station, with a printing-press, which has issued over 3,000 volumes in the old and new Syriac languages. The station has several native preachers and teachers. Pop. estimated at from 25,000 to 50,000.

Urmia or **Urumia, Lake**: in the province of Azerbijan, Persia; 64 miles S. W. of Tabriz; covers an area of 1,420 sq. miles, and is 4,000 feet above sea-level. It receives several large rivers, but has no outlet. Its waters are so impregnated with saline substances that neither fish nor molluscs can live in it.

U'rochorda: a name sometimes given the TUNICATA (*q. v.*) in allusion to the fact that the notochord is restricted to the caudal region.

Urode'la, or **Urodeles** [from Gr. οὐρά, tail + δῆλος, evident]: one of the subdivisions or "orders" of AMPHIBIA (*q. v.*), often called *Gradientia* in allusion to their walking as opposed to the jumping gait of the frogs and toads, the *Salientia* of systematists. The urodeles have an elongate body terminated by a long tail which is flattened in the aquatic forms, rounded in the terrestrial species. In all forms (except *Siren*, which has no hind legs) the body is supported on two pairs of limbs, but in several species these are small, and show a tendency toward degeneration in the diminution in number of digits from the typical four fingers and five toes. In the larval stages respiration is effected by external gills upon the sides of the neck, and in a few forms (*Perennibranchiata*) these are retained throughout life. In others they entirely disappear, and the gill slits on the sides of the neck may remain open (*Derotremata*) or entirely close (*Caducibranchiata*). In these latter respiration has been supposed to take place by lungs, but recently it has been shown that in a few species lungs are never developed, and that in all stages all traces of a trachea or windpipe are lacking. Most of the urodeles lay their eggs in water, but *Amphiuma* wraps the long strings of eggs about her, thus recalling the habits of several of the frogs and toads. It is to be noted that Cope has restricted the order Urodela on skeletal characters, taking from it the *Siren*, *Proteus*, and *Necturus*, and adding to it the CÆCILIDÆ (*q. v.*).

The classification of the urodeles is yet in an unsatisfactory condition. One scheme has been outlined above; a second divides them into *Ichthyodea* and *Salamandrina*, according as eyelids are absent or present; while Cope arranges the ten families which he recognizes in four groups based upon peculiarities of skull and vertebral column. There are about 100 species known from the whole world, the order being best represented in North America. Among the more interesting forms may be mentioned the common salamander of the Eastern U. S., *Diemyctylus viridescens*, in which two stages occur originally described as distinct genera. The first, after leaving the water, is red, and indicates a period of sexual immaturity; it later enters the water, changes its shape slightly, becomes an olive green, and is then sexually mature. Later no change occurs.

Among the species of *Amblystoma* the larval branchiate condition is retained until the animal becomes of considerable size, and these larvæ were long known as a distinct genus, *Siredon*, and in some cases these larvæ were capable of sexual reproduction without the assumption of the adult characters. The axolotl of the Lake of Mexico is apparently a Siredon stage of some *Amblystoma*, but its transformation into the adult has never been witnessed, the many records of such change being in reality made upon another species, *Siredon lichenoides*, the young of *Amblystoma mavortium*. In the *Salamandra atra* of the Alps the young are born alive. In the oviduct with the developing young are other eggs which serve as nourishment. The young before birth have very large gills, but these are entirely absorbed before birth. A strange feature is found in the Spanish *Pleurodeles*, where the ends of the ribs penetrate the skin, protruding as a series of spines along either side.

LITERATURE.—Cope, *Batrachia of North America*, *Bulletin* U. S. Nat. Museum No. 34 (1889): Boulenger, *Catatogue of the Batrachia Gradientia in the British Museum* (London, 1883). J. S. KINGSLEY.

Uropel'tidae [Mod. Lat., named from *Uropel'tis*, the typical genus; Gr. οὐρά, tail + πέλτη, shield]: a family of snakes. The body is cylindrical, the head short and pointed, with no apparent neck; the eyes are very small; the cleft of the mouth is comparatively narrow; teeth are in both jaws, but none on the palate; there are no rudiments of posterior extremities; the tail is short and blunt, and has a naked terminal shield of keeled scales. The family is composed of several genera, mostly confined to the East Indies and the Philippine islands. F. A. L.

Urpethite: See WAX.

Urquhart, ŭr'kart, DAVID: political writer; b. at Bracklanwell, County Cromarty, Scotland, in 1805; educated at St. John's College, Oxford; entered the diplomatic service; traveled extensively in the East; was secretary of legation at Constantinople 1835–36; resigned that post in consequence of his opposition to Lord Palmerston's Eastern policy, which he denounced as subservient to the ambitious views of Russia; made a vigorous warfare upon that policy in the press for several years, and continued it in Parliament, where he sat as a Conservative member for Stafford 1847–52. D. in Naples, May 16, 1877. His writings did much to foster jealousy and suspicion of Russia's Eastern policy. Among them may be mentioned *England, France, Russia, and Turkey* (1835); *The Spirit of the East, a Journal of Travels through Roumeli* (2 vols., 1838); *Diplomatic Transactions in Central Asia* (1840); *The Progress of Russia in the West, North, and South* (1853); *Letters and Essays on Russian Aggressions* (1853); *Recent Events in the East* (1854).

Urquiza, oor-kee'thăă, JUSTO JOSÉ, de: general and politician; b. near Concepcion del Uruguay (now in Entre Rios, Argentine Republic), Mar. 19, 1800. He received a rudimentary education at Buenos Ayres, became a clerk and a country storekeeper, and gradually acquired great influence over the *gauchos*. From 1835 to 1842 each province fell, practically, into the hands of a dictator, who in most cases was more or less subservient to Rosas, the dictator of Buenos Ayres. As leader of the federalist party, Urquiza became the chief power in Entre Rios, and he was elected governor in 1846. His rule was irresponsible and was directed mainly toward his own aggrandizement. He acquired great wealth, but by wise management was generally able to maintain peace and prosperity while cementing his power. In 1844–45, as an ally of Rosas and Oribe, he marched into Uruguay with 4,000 men, and defeated Rivera at the battle of India Muerta Mar. 28, 1845. He was also successful in a war with the unitarian faction which had risen to power in Corrientes. When the dictatorship of Rosas threatened the autonomy of the provinces, Urquiza turned against him and in 1851 joined with Brazil and the government of Montevideo. Marching into Uruguay, he compelled Oribe to capitulate Oct. 8, 1851. The allied forces then invaded Buenos Ayres, and Rosas was defeated and overthrown at the battle of Monte-Caseros Feb. 3, 1852. Urquiza was proclaimed provisional dictator, and the provinces, except Buenos Ayres, having adopted a federal constitution, he was elected president of the Argentine Confederation for the term of six years beginning in May, 1853. By his victory over Mitre at Cepeda Oct. 23, 1859, he compelled Buenos Ayres to join the confederation. At the end of his presidential term he took command of the army against Buenos Ayres, which had revolted. Mitre defeated him at Pavon Sept. 17, 1861, and the federalist constitution was abandoned for the unitarian one now in force. Urquiza retired to Entre Rios where he continued to exercise a semi-dictatorial power, though nominally subject to the central government. He refused to take part in the Paraguayan war. On Apr. 11, 1870, a band of political opponents murdered him on his estate near Concepcion.

HERBERT H. SMITH.

Ursa Major [=Lat., liter., Greater Bear]: the first of Ptolemy's northern constellations, including the fine group of seven stars known as Charles's Wain, the Dipper, or the Butcher's Cleaver, near the north pole, formerly called also *Septentriones* (likewise *Septemptriones*) and the Plow.

Ursa Minor [=Lat., liter., Lesser Bear]: one of Ptolemy's northern constellations, containing the North Star (*Polaris*) and the group anciently known as Cynosura, the Dog's Tail. Polaris is a star of the second magnitude. About 15° from it is another equal star, β Ursæ Minoris. In the latitude of the Northern U. S. neither of these stars ever sets. S. N.

Ur'sidæ [Mod. Lat., named from *Ur'sus*, the typical genus, from Lat. *ur'sus*, bear; cf. Gr. ἄρκτος: Sanskr. *ṛkṣa-*, bear]: a family of carnivorous mammals embracing the bears. These have the body heavy, the hair abundant, the muzzle more or less pointed, the feet plantigrade, and each with five digits fully developed, armed with sharp non-retractile claws; the teeth in adult 36 to 42 (M. $\frac{2}{3}$, P. M. $\frac{4}{4}$ ($\frac{3}{2}$), C. $\frac{1}{1}$, I. $\frac{3}{3}$ ($\frac{2}{3}$) × 2); last true molar of the upper jaw is oblong and exceeds the first; the last premolar of the upper jaw, as well as the succeeding true molars, is tubercular; the first true molar in the lower jaw is narrow, but longest; the second oblong and broader. The family is widely distributed, and has representatives in the extreme arctic regions as well as in the temperate and torrid zones—in America, Europe, and Asia, and in the north of Africa. About fifteen species are known, which have been distributed by recent systematists under six genera—viz., *Thatarctos* (polar bear), *Ursus* (ordinary bears), *Tremarctos* (South American), *Helarctos* (Indian, etc.), *Melursus* (the *Ursus labiatus* of India), and *Æluropoda* (Tibetan): the last two are very distinct; the others closely related. See also BEAR.

Revised by F. A. LUCAS.

Ursua, ŏor-soo'-ăă, or **Orsua**, PEDRO, de: soldier; b. at Ursua, Navarre, about 1510. He joined a Spanish expedition to New Granada; was governor of that country 1545–46 and subsequently led two expeditions to the E. and N. E. of Bogotá, in search of El Dorado. Pamplona and other towns now in Santander were founded by him. In 1555–57 he commanded a force against the Cimarrones or fugitive slaves of the Isthmus of Panama, and completely subdued them. In 1559 the Viceroy of Peru placed him in command of an expedition, the avowed object of which was to find and conquer the reported "kingdom" of the Omaguas, on the upper Amazon; secretly, the viceroy's purpose was to get rid of the turbulent soldiers who had been drawn to Peru by the civil wars, and in this he was successful, several hundred of them enlisting for the expedition. Ursua assumed the title of governor of Omagua and El Dorado; he embarked on the Moyobamba in Sept., 1560, and descended the Ucuyali to the Amazon. There a conspiracy was formed against him by LOPE DE AGUIRRE (*q. v.*) and others, and he was murdered at Machiparo, Jan. 1, 1561. H. H. S.

Ursula, SAINT: See URSULINES.

Ur'sulines [deriv. of *Ursula* (see below), liter., dimin. of Lat. *ur'sa*, bear]: an order of celibate women in the Roman Catholic Church, named in honor of St. Ursula, who, according to legend, suffered martyrdom in the third, fourth, or fifth century, being massacred, together with her army of virgins, by the Huns near Cologne. The order was founded by St. Angela Merici of Brescia, who in 1537 became its first superior. In 1544 Paul III. approved the order, and Gregory XIII. and Clement VIII. gave it their sanction. St. Charles Borromeo was another powerful friend of the Ursulines. They have houses in various countries, and are chiefly devoted to the training of girls.

Revised by J. J. KEANE.

Urtica'ceæ: See NETTLEWORTS.

Urticaria: See NETTLE-RASH.

Uruguay, Span. pron. ŏŏ-rŏŏ-gwī' (officially, *República Oriental del Uruguay*, formerly *Cisplatine Republic* or *Estado Oriental*): the smallest of the South American republics; in the southeastern part of the continent and

entirely in the south temperate zone; bounded N. by Brazil, E. by the Atlantic and Brazil, S. by the Rio de la Plata, and W. by the Uruguay river, separating it from the Argentine Republic. Area, 72,170 sq. miles.

Physical Features.—The general surface is rolling or hilly, with many ridges crossing in different directions. In the central and northern parts some of these are over 1,500 feet high. Bordering the Uruguay there are fertile plains resembling the pampas of the Argentine, and near the Atlantic are extensive swamps and lagoons, separated from the ocean by wide sand-dunes. Most of the land is open prairie; the largest areas of forest are in the western part. Besides the Uruguay and Plata, the only important river is the Negro, which flows to the Uruguay and is navigable for small vessels in its lower course. Lake Miri, on the northeastern frontier, is entirely included in Brazil, but furnishes an outlet to the N. for the Uruguayan territory bordering on it. Uruguay has no good natural harbors. The best is that of Montevideo, on the Plata, where elaborate improvements have been planned. Maldonado, at the extreme southeast angle of the coast, is protected only by a projecting point, but it is much used for a shelter during storms. A few rocky islands in the Plata belong to Uruguay; Flores, one of these, is the quarantine station. The climate is temperate and healthful; the winter months (May to October) are marked by a lower but not unpleasantly cold temperature, with occasional light snows and severe southerly storms called *pamperos*; rains are abundant almost all the year.

Natural Products; Industries.—Gold is washed on a small scale; there are fine marbles, much used for building at Montevideo, and agates and fossil woods are exported to Germany. Other minerals, including coal, are reported, but their richness has probably been exaggerated. The soil in many places is very fertile; wheat and fruits (apples, pears, quinces, etc.) are extensively grown, especially in the valley of the Uruguay. But the principal and almost the only prominent industry is stock-raising, for which the land is especially adapted. In 1898 there were 4,826,675 cattle, 363,511 horses, and 15,536,889 sheep, the latter rapidly increasing in numbers. Much of the land is held in large estates on which the cattle run almost wild; nearly all the small land-holdings are in the agricultural districts settled by recent immigrants. Subsidiary to the grazing industry are many *saladeros*, where jerked beef is prepared, one or two condensed-meat factories, and a few tanneries.

Communication.—The common roads are generally bad; the ordinary vehicles are huge, squeaking, two-wheeled carts, each drawn by several yokes of oxen. Diligences, drawn by mules, are much used. In some of the more remote districts traveling is still somewhat dangerous, owing to brigands. Uruguay has now several railways, most of them radiating from Montevideo and one crossing the country to the Brazilian frontier; in 1898 the aggregate length open for traffic was 1,080 miles. There is a fairly good interior system of telegraphs and cable communication with Europe and the U. S.

Commerce is very active, the exports exceeding $25,000,000 and the imports $30,000,000 annually. Nearly all of this is carried on foreign vessels, the Uruguayan merchant marine being small. The principal exports are wool, hides, bone-ash, tallow, frozen, salted, and condensed meats, wheat, and fruits. The trade is mainly with Great Britain (about one-third), France, Belgium, and Brazil. The imports from the U. S. were valued in 1890 at $3,210,112, but have since fallen off; the exports to that country reach about $2,000,000 annually. The standard of value is the *peso fuerte* or dollar, equal to $1.034 in U. S. currency; no gold and little silver are coined, but gold coins of other countries circulate freely. Government paper, and to a certain extent bank-notes, fluctuate in value. The metric system has been legalized, but the old Spanish standards are still in general use. See URUGUAY in the Appendix.

Population.—In 1892 this was 728,447. The native population embraces a small educated and wealthy class, but the great mass, especially in the grazing districts, is of the mixed race called GAUCHOS (*q. v.*); owing to their roving and turbulent disposition these people readily follow any revolutionary leader. For many years a steady stream of immigration, mainly from Italy, Spain, and Brazil, has added a laborious and useful class to the population. In 1890 about two-fifths of the inhabitants were of foreign birth, and they held over half of the wealth; commerce is almost entirely controlled by foreign merchants. All the culture and much of the wealth are gathered at Montevideo, the capital and only large city. In the frequent civil wars Montevideo has generally been held by one party and the interior by the other.

Government, Religion, Education.—Uruguay is a centralized or unitarian republic, divided, for administrative purposes, into nineteen departments. Congress consists of two houses; these, in joint session, elect the president for a term of four years, and he is ineligible for re-election during the two following terms. The established religion is the Roman Catholic, but the Church receives only a small subvention, and all other sects are tolerated. Primary education is compulsory; in 1898 there were 887 public and private schools. Montevideo has a national university, school of arts and trades, museum, etc. The army, on a peace footing, consists of 3,500 men, and the navy is insignificant. On Jan. 1, 1900, the entire internal and foreign debt, according to an official statement, was $127,159,529. The finances are in bad condition, the revenue (mainly derived from customs duties) being constantly less than the expenditure if the service of the debt is included. By an arrangement with bondholders, made in 1892, the interest on the foreign debt was reduced one-half.

History.—Of all the South American countries Uruguay was the last settled by Europeans. This was partly owing to the fierce character of the Charruas and other Indian tribes near the coast, though the interior was inhabited by the pacific Guaranys. In 1624 the mission of Santo Domingo de Soriano was founded on the Rio Negro. Portugal claimed all the land N. of the Plata, and in 1680 established Colonia de Sacramento, a fortified post, nearly opposite Buenos Ayres; this was repeatedly besieged, and was alternately held by the Portuguese and Spanish until its final cession to the latter in 1778. Portuguese who had fortified the bay of Montevideo were driven out in 1726, and the city was founded soon after. It became the capital of the country and the residence of governors who, after 1776, were subordinate to the viceroy at Buenos Ayres; in 1807 the city was taken by the British, but it was soon evacuated. The revolution of 1810 in Buenos Ayres quickly spread to the *gauchos* of Uruguay, but a strong Spanish force held Montevideo until 1814. The country remained in a disordered state under the irresponsible government of Artigas, a *gaucho* leader. Depredations on the northern frontier gave a pretext for the interference of the Portuguese, who still claimed this region as a part of Brazil. After a desultory war of several years, Artigas was driven out and Uruguay was annexed to Brazil as the Cisplatine state (later, when Brazil became independent, the Cisplatine province). Revolts, encouraged by Buenos Ayres, broke out in 1825, and were finally successful in 1828, when both Brazil and Buenos Ayres recognized the independence of Uruguay. The political parties, *Blancos* and *Colorados*, speedily plunged the republic into fresh civil wars, alternately seizing the presidency. Rosas, dictator of Buenos Ayres from 1835, wished to extend his power into Uruguay; and Montevideo was the special object of his hatred because it sheltered the numerous fugitives from his tyranny, and, profiting by his narrow commercial policy, was rapidly absorbing the trade of the Platine region. He therefore espoused the cause of Oribe, the revolted chief of the Blancos, who, thus aided, held most of the interior from 1842 to 1851, besieging Montevideo at intervals; this period is known as the Nine Years' Siege. Brazil and Entre Rios at length interfered. Oribe was forced to capitulate in 1851, and Rosas was overthrown soon after. In 1862, the Blancos being in power, ex-President Flores led a revolt of the Colorados, and was eventually supported by Brazil, which had unsatisfied claims against the regular government. Thus aided, Flores took Montevideo and became president in 1865. Lopez, dictator of Paraguay, made this affair the pretext for a war on Brazil, in which Uruguay and the Argentine engaged as allies of the latter country. This war, one of the most bloody ever known in South America, was ended by the death of Lopez in 1870. From that year until 1876 Uruguay had several civil wars. Since then the country has been comparatively quiet and prosperous, and it is probable that the extension of railways will furnish a check to the dangerous *gaucho* class. In 1890–91 there was a sharp financial crisis.

AUTHORITIES.—*Apuntes para la historia de la República Oriental del Uruguay, por A. D. de P.* (2 vols., 1864); DeMaria, *Compendio de la historia de la República Oriental del Uruguay* (1875); Mulhall, *Handbook of the River Plate*, (6th ed. 1892); Bureau of the American Republics, *Handbook of Uruguay*, with map (1892). HERBERT H. SMITH.

Uruguay: a river of South America; rises on the western slope of the Brazilian Coast Range, on the confines of Santa Catharina and Rio Grande do Sul; flows W. between those two states, then S. W. between Rio Grande do Sul and the Argentine Republic, and finally S. between Uruguay and the Argentine, and empties into the Rio de la Plata, which is the estuary of the Paraná and Uruguay combined. The upper portion is called the Pelotas, and locally the Uruguay is said to be formed by the junction of the Pelotas and Canoas. It is essentially a highland river like the São Francisco and upper Paraná; the only extensive flood-plains are on the western side near its mouth, and the river brings down comparatively little sediment. The valley is varied with hills, and contains much forest, especially in its upper portion, which is an almost unknown wilderness; lower down there are extensive grassy plains suitable for grazing, and from about lat. 29° S. there are numerous stock-farms and some considerable towns. As a means of communication the Uruguay is important, though much inferior to the Paraná. Large steamers ascend to Paysandú, in Uruguay, about 150 miles from the Plata, and small ones to Salto, 50 miles farther. At this point there is a fall, but beyond it barges are used for 300 miles, and a considerable part of the trade of Western Rio Grande do Sul takes this channel. The exports by the river are hides, cattle, meat, etc. Whole length of the Uruguay and Pelotas, over 1,100 miles. Toward the mouth the river is 7 or 8 miles wide, but divided by islands. The annual flood in September or October attains 20 and occasionally 40 feet. The principal affluents are the Ibicuy, in Rio Grande do Sul, the Quaraim or Cuareim, forming part of the boundary between Brazil and Uruguay, and the Rio Negro in the latter country. HERBERT H. SMITH.

Uruguay: a city of Argentina. See CONCEPCION DEL URUGUAY.

Uruguayana, oo-roo-gwī-aa′nă̆a: a town of Rio Grande do Sul, Brazil; on the river Uruguay, near the southwestern angle of the state, and connected with Pelotas and Montevideo by railway. It is the center of the grazing industry of Western Rio Grande do Sul, and has an important river trade. Here, on Sept. 18, 1865, the Paraguayan invading army of 6,000 men surrendered to the allies, who were commanded by the Emperor of Brazil, President Mitre of the Argentine Republic, and President Flores of Uruguay. Pop. (1894) about 6,000, and rapidly increasing. H. H. S.

Urumia: town and lake of Persia. See URMIA.

Urumt′si: city of Central Asia, with a population estimated at 40,000; at the northern foot of the T'ien Shan Mountains (see map of China, ref. 2–D). It became the capital of the Chinese Mongolian province of the same name, and in 1862 it formed the center of the Dungan rebellion. In the commerce of Central Asia, Urumtsi formerly occupied the same position as Nijnii-Novgorod in that of Eastern Russia. Goods from Russia, Turkistan, Persia, and Kashmir flowed to this place, numerous merchants' offices and Chinese banks were established here, and by its well-stocked magazines Urumtsi held a perpetual fair. But the uncertainty consequent on the Dungan rebellion put an end to this traffic. Dungan, a corruption of *Tangut*, is the name of the 4,000,000 Mussulmans of Turkish-Tartarian descent who inhabit the northern provinces of China, and who on account of the enormous taxes rose in revolt in Shen-si in 1862, and pushed into Southern Mongolia, where they took Urumtsi. Revised by M. W. HARRINGTON.

Urus [= Lat., from Teuton.; cf. O. H. Germ. *ūr*: Icel. *ūrr*: O. Eng. *ūr* > Eng. *owre* (obs.), aurochs; cf. also O. H. Germ. *urohso* (*ūr*+*ohso*, ox) > Mod. Germ. *auerochs*, whence Eng. *aurochs*]: a wild ox, the *Bos primigenius*, now extinct, although mentioned by Cæsar as inhabiting the forests of Germany, and, so late as the sixteenth century, an object of the chase. It was very large, with a flat forehead, and spread of horns of 4 feet or more. Judging from the remains, it was domesticated by the Swiss lake-dwellers, and the modern Scotch cattle, and possibly the CHILLINGHAM CATTLE (*q. v.*), are its direct descendants. See also the article AUROCHS. F. A. LUCAS.

Usage: the habitual practice of a person, a class, a trade, or a community. The term is used often interchangeably with custom. Strictly speaking, however, custom is a usage which has acquired the force of law. For example, the custom of merchants allowing days of grace on a bill of exchange or promissory note has long been a part of English common law. A custom need not be proved; judges will take judicial cognizance of it, and contracting parties can not plead ignorance of it. On the other hand, a usage must be proved by the party whose case depends upon its existence. It may be established by the evidence of one witness if his means of knowledge and his credibility are satisfactory.

A usage may be proved for the purpose of adding a term to a written contract or to give a special meaning to its language. This is allowed on the theory that the parties did not mean to express in writing the whole of their agreement, but contracted with reference to the usage in question. It is assumed that the parties knew of the usage. Hence if either of them can show that he had neither knowledge nor notice of the usage it can not affect him. Moreover, it can influence the construction of the contract only when it is, in the opinion of the court, not unreasonable, is not contrary to the positive rules of law, and is not inconsistent with the clear provisions of the contract. In other words, a usage is competent to explain or annex incidents to a contract, but not to contradict its express terms. For a full treatment of the subject, the reader is referred to Clarke's edition of Browne's *Usages and Customs*; Lawson, *Usages and Customs*. FRANCIS M. BURDICK.

Usamba′ra: the mountainous northeastern part of German East Africa, separated from the Indian Ocean by a low coastal plain. Coffee and cotton are successfully raised in this district, and a railway is (1895) being built to connect Tanga, the chief port, with these upland plantations. The climate is fairly healthful. C. C. A.

Uscup′, or **Scop′ia** (lookout): town; in the vilayet of Kossova, European Turkey; on the Vardar (see map of Turkey, ref. 3–B). It is on the Salonica-Mitrovitza Railway, and is the proposed point of junction of the South Danubian railway system. Besides being the residence of the provincial governor it is the seat of a Greek archbishop. It manufactures leather and has a large transit trade. Pop. 13,000. E. A. G.

Use: See USES.

Use and Occupation: Whenever the land or building belonging to one person is occupied by another, either under an express agreement or under such circumstances that the law will infer an agreement, but without any stipulation as to the amount of rent, the owner may recover from the tenant such compensation in the nature of rent as the occupation is reasonably worth. The action under these circumstances is said to be for the "use and occupation of the premises." The right to recover is based upon the notion that the possession was taken and held in pursuance of a contract, express or implied, and the action is brought upon the tenant's implied promise to pay. If, therefore, the entry is tortious, and the land is held adversely and not in subordination to the owner's right, no action for use and occupation can be maintained, since no promise can be inferred. The remedy of the owner in that case is an action for damages resulting from the unlawful trespass. See LANDLORD AND TENANT. Revised by G. W. KIRCHWEY.

Usedom, oo′ze-dōm: a low, irregular, and little productive island belonging to Prussia; situated at the mouth of the Oder, between the Baltic and the Stettiner Haff; area, 157 sq. miles. On its northeastern shore is the port of Swinemünde.

Usener, HERMANN: classical scholar; b. at Weilburg, Germany, Oct. 23, 1834; studied under Ritschl at Bonn, in Heidelberg, Göttingen, and Munich; teacher at the Berlin Joachimsthaler Gymnasium in 1858; professor extraordinary at Berne in 1861; ordinary professor in Greifswald 1863, whence he was called to Bonn in 1866. Among his many famous writings are *Analecta Theophrastea* (1858); *Alexandri Aphrodiensis Problemata* (1859); *Scholia in Lucanum* (1869); *Anecdoton Holderi. Ein Beitrag zur Geschichte Roms in ostgothischer Zeit* (1877); *Legenden der heiligen Pelagia* (1879); *Altgriechischer Versbau* (1887); *Epicurea*, the standard work on the subject (1887); *Religionsgeschichtliche Untersuchungen* (1889); *Theodoros u. Kyrillos*; *der heilige Theodosios* (1890); *Unser Platotext* (1892); *Die Unterlage des Laertius Diogenes* (Berlin Acad. publications, 1892); and numerous penetrating treatises, published in *Rheinisches Museum*, university programmes, and elsewhere. He also edited Kayser's *Homerische Abhandlungen* (Leipzig, 1881) and J. Bernays's *Gesammelte Werke* (2 vols., Berlin, 1885). ALFRED GUDEMAN.

User'tesen, or **Usertsen**: the name of three kings of the twelfth Egyptian dynasty, who with Amenemhat I.–IV. composed one of the most notable royal families in Egyptian history. Their period was one of great brilliancy, and its special chronology is as exactly determinable as any in Egyptian annals. It succeeds a period of anarchy and the rule of petty princes, but it gradually grew to a degree of power unequaled except under Thothmes III. of the eighteenth and Ramses II. of the nineteenth dynasty. The excellence of its artistic work was surprising, and is contrasted vividly with that of later times, particularly in the instances where its monuments were usurped by the degenerate Meneptah, of the nineteenth dynasty.

Usertesen I. (*Kheper-ka-ra*, the Sesonchosis of Manetho) was for ten years associated with Amenemhat I. as coregent. It is probable that the latter came to the throne at advanced age, and that the administration of affairs, at first foreign and later domestic as well, early fell into the hands of Usertesen I. His total reign covered about forty years, and he succeeded in strengthening the strong government established previously. In his earlier years he waged war with the Libyans and with the Ethiopians. In Sinai he opened the mines that had been worked under the earlier dynasties; at Tanis he built temples and erected several statues, which have come down to us, showing great fineness of work and excellence of execution and finish; he erected a temple to Osiris at Abydos; worked the quarries of Hammamat; adorned the temple at Koptos; built a temple at Heliopolis, whose only remnant is the solitary obelisk now *in situ*. A broken obelisk at Begig in the Fayûm shows that he was also busy in this region, which was the scene of much active labor on the part of his successors. During the last two years of his reign Amenemhat II., his son, was associated with him.

Usertesen II. (*Kha-kheper-ra*, the Sesostris of Manetho) succeeded Amenemhat II. and enjoyed a long reign, supposed by Petrie to have covered thirty-nine years. The entire uncertainty as to the chronology of the dynasty falls upon this reign, and the length of it is uncertain. The highest monumental record is of the tenth year, but Manetho assigns forty-eight years to him. His pyramid is that at Illahun, at the mouth of the Fayûm. It has as a core a mass of native rock, in which the sepulchral chambers and passages were cut, and it was composed of brick with a facing of limestone. Unlike other similar structures, it has two entrances on the south side, apparently to perplex would-be robbers. But one of them was discovered by workmen of Ramses II., and the contents were then rifled. The houses of the workmen at Kahun even now cover 18 acres, and their remains were mistaken by Lepsius for the ruins of the labyrinth.

Usertesen III. (*Kha-kau-ra*, the Lachares of Manetho), the following king, built as his mausoleum the northerly brick pyramid at Dahshur, adopting a plan for the deposit of funereal remains different from any previous method. Subterranean passageways were excavated around the base of the structure with adjacent chambers in which the mummies were placed. The pyramid was explored by de Morgan in 1894. Usertesen III. also built temples at Tanis, Bubastis, and elsewhere in the Delta region, but he is best known on account of the expeditions which he led into Nubia. In order to facilitate transportation to the southward, he caused a canal to be constructed around the first cataract of the Nile. In his eighth year he built forts and temples at Semneh and Kummeh, 30 miles S. of the second cataract, erected several stelæ there, and prohibited the passage of Negroes northward except for the purpose of trade. Under him Egypt entered upon the policy of foreign conquest, which reached its climax during the eighteenth and nineteenth dynasties. His reign lasted thirty-eight years. His successor, Amenemhat III., devoted himself to internal improvements, regulated the flow of the Nile by means of dams erected to control the flow of water into and out of the Fayûm (Lake Mœris), which is supposed by some authorities to have constituted a large inland sea at that time. From the lake he reclaimed certain portions, and on them built his pyramid at Hawara and also the neighboring labyrinth.

CHARLES R. GILLETT.

Uses [viâ O. Fr. from Lat. *u'sus*, a using, use, deriv. of *u'ti*, *u'sus*, to use]: in law, rights, recognized only in equity, to the possession and enjoyment of real estate, the legal title to which is vested in another. At an early day the English ecclesiastics, in order to avoid the Statutes of Mortmain, which forbade them to take or hold lands in England (see MORTMAIN), contrived a plan whereby they might enjoy all the benefits of ownership without taking or holding the forbidden title. The land was conveyed by the donor to some person in the ordinary manner, but the conveyance was accompanied with the direction—which might be contained in the deed, or *charter*, of feoffment, or which might be a mere oral declaration of intention—that the grantee should hold the land to the use, or to the benefit (*ad usum* or *ad opus*), of a designated person or corporation. Originally the obligation and duty thus imposed upon the person to whom the land was conveyed—that he should be seized of the land, but for the benefit of another; that he should have the legal title, but that another should be allowed to enter upon and enjoy the land—was purely conscientious and could be enforced, if at all, only by the power which resided in the Church. There is no doubt that in very many cases a partial or complete deprivation of spiritual rights and privileges, and in some cases the infliction of temporal pains as well, awaited the *feoffee to uses* who was disposed to rest upon his legal rights and to ignore the intention with which the land was conveyed to him. As early as the reign of Richard II., however, the indefinite sanctions of the Church had been re-enforced by the growing jurisdiction of the chancellor, who, himself usually an ecclesiatic, was the natural custodian of the king's power to enforce even conscientious and extra-legal obligations. The courts of common law knew nothing of all this. If the chancellor chose to hold men to the performance of pious duties undertaken by them, he might do so; but nevertheless the title, the property, was effectually vested in the feoffee, who was, notwithstanding the uses, the only one possessing any legal interest. Meanwhile, however, the court of chancery enforced the trust that had been imposed on the feoffee, and regarded the beneficiary, or *cestui que use*, as the real owner, entitled to the possession, profits, and complete control of the land. This was the "use."

From this time on the practice of conveying lands to uses, even as between private and non-religions persons, grew apace. It was of the utmost convenience to all sorts and conditions of men and, even more, of women. Not only the religious houses, but also married women and aliens—who were equally incapacitated from holding lands at common law—might be the beneficiaries of uses. Moreover, being utterly unknown to the common law, not being an estate or interest in lands, the use was of course entirely free from the vexatious and burdensome incidents and restraints of tenure as it existed at common law. It could be devised by will, and conveyed without any public delivery of possession (*livery of seisin*), while it would yet descend to the heir, if not otherwise disposed of, just as the legal title descended at common law. The *cestui que use* was not, under the feudal *régime*, liable to perform the service of military duty, nor could he be called upon for "aids" or "reliefs," nor was he subject to the feudal exactions of "wardship" or "marriage." (See TENURE.) It is therefore not to be wondered at that the system of conveying lands to be held "to uses" became exceedingly prevalent, nor, on the other hand, that it was in the highest degree obnoxious to the king and the other great landowners. Several ineffectual attempts were made by Parliament to remedy this anomalous and, as it was considered, mischievous state of affairs, and these attempts finally culminated in that drastic effort of legislation, the Statute of Uses, passed in the twenty-seventh year of Henry VIII. (A. D. 1535). This celebrated enactment provided, in substance, that whenever lands should be conveyed in fee to one person for the use or benefit of another, the complete title, legal and equitable, should at once vest in the latter, free from any use, and that no interest whatever should attach to the former. "The object of the statute was, by joining the possession or seisin to the use and interest (or, in other words, by providing that all the estate which would by the common law have passed to the grantee to uses should instantly be taken out of him and vested in *cestui que use*), to annihilate altogether the distinction between the legal and beneficial ownership, to make the ostensible tenant in every case also the legal tenant, liable to his lord for feudal dues and services, etc." But so far as this, its main object, was concerned, the statute was almost a complete failure. It did not have the effect of abolishing uses; it did not, except to a very limited extent, restore to the lord his feudal dues. Partly in consequence of the looseness with which the statute was drawn, partly as a result of a long and ingenious

process of judicial construction of its terms, the courts of equity were not long in reviving the system of uses under the name of "trusts." In that form and under that designation this system has continued with great vigor and success to the present day, when it is the chief ornament of the equity tribunals. See TRUSTS.

The statute, however, in so far as it was allowed to operate, had another and wholly unanticipated effect. By virtue of the fact that the practice of conveying lands to uses continued unabated, and the further fact that the statute "executed" certain of these uses, i. e. converted them into legal estates, the courts of common law at once acquired jurisdiction over a vast number of new interests in land. This species of legal estate, being created "by way of use," was allowed by the common-law tribunals to retain in large measure the form and character which had been impressed upon it in equity before it had acquired legal recognition. The equity tribunals had recognized uses which bore no analogy to estates as they existed at common law and which were, indeed, repugnant to the common-law system. Thus it was an inflexible rule of that system that no future estate could arise, or be "limited," except as a "remainder" or "reversion," and it was a characteristic of these estates that the remainder or reversion must be immediately consequent upon some prior estate less than a fee simple. Thus a limitation to A for life, with remainder to B after the death of A, would be good; but a limitation of a future interest to B, to take effect a year or even a day after A's death, would be bad as a remainder. But there was no reason why the court of chancery should not enforce a use to arise at any time in the future, whether it was supported by a precedent use or not. Hence arose those varieties of future interests known as "springing" and "shifting uses," and when the courts of common law took jurisdiction of executed uses under the statute, they preserved these new and useful forms of estates under those names, and added them permanently to the older body of common-law limitations. It was in this indirect and unintended way that the English law of real property was revolutionized and brought into conformity with modern conditions. The new methods of conveyancing introduced by virtue of this transformation persisted for three hundred years, until abolished by statute in England and the U. S. See BARGAIN AND SALE.

Uses, under that name and as a separate system, no longer exist, all conveyances "by way of use" being referred either to the jurisdiction of equity as trusts or to the common-law limitations of real property, as above described. The whole system as thus developed and altered, together with the Statute of Uses, forms a part of the jurisprudence of the U. S., except in a few jurisdictions where it has been expressly abolished by statute.

The learning of uses is somewhat refined and abstruse, and has engaged the attention of many of the ablest minds at the English bar. Perhaps the most elaborate treatises are those of Sir Francis Bacon (*Reading upon the Statute of Uses*) and Lord Chief Baron Gilbert (*Law of Uses and Trusts*). The various authoritative works on real property and conveyancing contain satisfactory statements of the system and its influence upon the law of property. The best modern authorities for that purpose are Leake, *Digest of the Law of Property in Land*, and Digby, *History of the Law of Real Property*. The older treatises of Littleton, Coke, Blackstone, Lord St. Leonard (*Handy Book of Property Law*) and Preston (on *Conveyancing* and on *Estates*) should also be consulted. The *History of English Law* by Pollock and Maitland contains a valuable note (vol. ii., pp. 224, 231) on the origin of uses. GEORGE W. KIRCHWEY.

Uses, Charitable: See CHARITABLE USES.

Ush'ant (Fr. *Ouessant*): the largest of a group of islands of the same name, off the coast of Brittany, France; belonging to the department of Finisterre. Area, 20 sq. miles. It is fertile, and has about 2,300 inhabitants, engaged in the rearing of cattle and in fisheries.

Ussher, or **Usher**, JAMES, D. D.: archbishop; b. in Dublin, Ireland, Jan. 4, 1580, or 1581; educated at Trinity College, Dublin, where he became a fellow 1600; took orders in the Church of England 1601; became chancellor of the Cathedral of St. Patrick about 1604; was Professor of Divinity at the University of Dublin 1607–20; drew up the Articles of Faith of the Irish Church 1615; became Bishop of Meath 1620, Archbishop of Armagh and Primate of Ireland 1624–25; had his house destroyed by the Irish rebels 1641, while visiting England, in which country he thenceforth remained; was given by Charles I. the temporalities of the vacant see of Carlisle, which made him practically the bishop, and as such he acted, and was preacher of Lincoln's Inn, London, 1647–54, residing chiefly at Oxford. D. at Reigate, Surrey, England, Mar. 21, 1656, and by order of Cromwell was buried with great magnificence in Westminster Abbey. He was the author of numerous theological treatises, mostly in Latin, of which a complete edition was published by the University of Dublin (17 vols., 1847–64), with a *Life* by Rev. C. R. Elrington. His *Annales Veteris et Novi Testamenti* (2 vols., 1650–54) contains a scheme of biblical chronology, since printed in the margin of the Authorized Version of the Bible and generally adopted by English and continental historians, though now admitted to be inexact. Another *Life*, with that of John Selden, was written by Dr. John Aikin (1811). His library now belongs to Trinity College, Dublin. He was a learned antiquarian, and the Epistles of Polycarp and Ignatius were first published by him. He was twice elected by the Long Parliament to the Westminster Assembly of Divines, but from loyalty to the king did not attend. He prepared the Irish Articles of Religion (1645), and proposed a system of reduced episcopacy as a compromise between Episcopalians and Presbyterians.

Revised by S. M. JACKSON.

Ustilagin'eæ: See SMUTS.

Usufruct: See SERVITUDES.

Usumacin'ta: a river of Guatemala and Mexico; formed by the union of several branches which drain the northwestern half of the former country; flowing with a general northwesterly but very crooked course, and joining, in Tabasco, the Grijalva, through which it reaches the Gulf of Mexico. Length about 400 miles. The lower part is navigable, and is connected by channels with the Bay of Campeche and the Laguna de Terminos. By the treaty of 1882 the upper Usumacinta, with its principal head, was agreed upon as part of the boundary between Mexico and Guatemala. After a survey, Guatemala claimed that the Salinas was the head; Mexico claimed that this was the Rio de la Pasion, which would extend her territory at one point so far E. as nearly to cut Guatemala in two. This question nearly led to a war in the early part of 1895. The disputed territory is mainly covered with forest. H. H. S.

Usury [*usury* is from O. Fr. *usure* < Lat. *usu'ra*, use, usury, interest, deriv. of *uti*, *u'sus*, use]: "When money is lent on a contract to receive not only the principal sum again, but also an increase by way of compensation for the use," the increase "is called interest by those who think it lawful, and usury by those who do not so." (Blackstone's *Commentaries*, 2, 454.) The term is now applied to the taking of an illegal rate of interest. For the early English statutes on this subject, see the article on INTEREST. Its economic bearings are considered in the article on POLITICAL ECONOMY, under the heading *Government Interference with Industry*. All usury laws in England were repealed in 1854, and the example has been followed to some extent in the U. S. Most of the States, however, prescribe a lawful rate of interest, and subject the taker of any excess to punishment as a criminal, as well as to the forfeiture of a part or the whole of the principal and lawful interest. In order to have a case of usury there must be a loan or forbearance of money. Hence one who buys negotiable instruments, bonds, or mortgages, or other choses in actions for less than their face value does not engage in a usurious transaction. (*Cram* vs. *Hendricks*, 7 Wendell (N. Y.) 569.) In many jurisdictions, however, it is held that the buyer of accommodation paper is a mere lender of money, and hence if he pays less than the face and legal discount the transaction is usurious. This doctrine is based on the view that the paper has no legal inception when delivered by the accommodating to the accommodated party, but takes its inception from its delivery to the buyer. (*Claflin* vs. *Boorum*, 122 N. Y. 385.) Corrupt intention is essential to usury. From this it follows, on the one hand, that whatever may be the form of the transaction, however cunning may be the devices for evading the statute, if the parties have in effect bargained for the loan or forbearance of money at a prohibited rate of interest, the transaction is under asttutory ban; on the other hand, if an illegal rate of interest is agreed upon or paid by mutual mistake, the statute is not violated, but the mistake may be corrected and the agreement really intended by the parties enforced. A valuable compilation of the modern statutes upon this subject is contained in Perley's *Law of Interest* (Boston, 1893).

FRANCIS M. BURDICK.

Utah: one of the States of the U. S. of North America (Western group); the thirty-second admitted to the Union. Capital, Salt Lake City.

Location and Area.—It extends from lat. 37° to 42° N., and from lon. 32° to 37° W. from Washington; is bounded N. by Idaho and Wyoming, E. by Wyoming and Colorado,

Territorial seal of Utah.

S. by Arizona, and W. by Nevada. Greatest length, about 350 miles; greatest width, nearly 300 miles. Area, according to the U. S. census 1900, 84,970 sq. miles (54,380,800 acres), of which 2,780 sq. miles are water surface; or, according to the U. S. Surveyor-General for Utah, 84,476 sq. miles.

Physical Features.—Utah is traversed N. and S. by one great range of mountains, the Wasatch, and there are several minor ranges, as the Deep Creek, Oquirrh, and San Francisco in the west, and the Roan or Book, the La Salle, the Sierra Abajo, and the Orejas del Oso in the east and southeast, all extending in the same general direction. There is also one great transverse range running E. from the Wasatch to the Rocky Mountains, along the northeast boundary. E. of the Wasatch Range the water flows into the Du Chesne, Green, Uinta, Price, Grand, White, Dirty Devil, San Juan, and San Rafael rivers, reaching the Pacific Ocean through the Colorado river and Gulf of California. W. of the Wasatch Mountains the waters, for the most part, flow into the Great Salt Lake, though there are several fresh-water lakes and "sinks" S. of the Salt Lake valley which receive the flows from the mountain rivers and streams. The Wasatch and Uinta Mountains are high and rocky, broken and furrowed into cañons and deep gorges. Some of their peaks reach an elevation of 14,000 feet. The other ranges are lower and less rugged. The only rivers of importance within Utah are the Green and the Grand, forming the Colorado. The others are little more than mountain streams, some of them of considerable volume in the spring and early summer, but receding or disappearing entirely later in the season. The rivers named have formed deep cañons or ravines, ranging in depth from 500 to 4,000 feet, the stream at many places being inaccessible. E. of the Wasatch Range the country is broken and rough, consisting of mountain spurs, high plateaus, and arid mesas, the soil being hard and clayey and generally weak. W. of the Wasatch there is a succession of valleys, extending N. and S. These vary in length from 1 to 40 miles, and in width from 1 to 15 or 18 miles. The valleys and mesas range in elevation from 4,000 to 7,000 feet. W. of the GREAT SALT LAKE (*q. v.*) is a vast alkaline desert, 100 miles in length and 40 miles in width. The chief fresh-water lakes are Bear Lake, 18 by 8 miles, in the extreme northeast corner; Utah Lake, 24 by 10 miles, in the central part; and Sevier Lake, 25 by 5 miles, in the southwest.

Soil and Productions.—In the main the soil is arid and much of it alkaline, some sections being so strongly impregnated with the salts as to render its reclamation impracticable. The soil of the valleys is sedimentary, gravelly, clayey, and sandy; that of the mesas is generally hard clay or rocky. However, the land is not, as a rule, difficult of reclamation where water for irrigation can be obtained, and with sufficient water the soil is extremely fertile. Agriculture is entirely dependent upon artificial irrigation, the rainfall being so slight and uncertain as to put reliance on it out of question. Weeks and sometimes months pass without a shower. In the valleys rain is infrequent and light from May until October. The result has been the development of an extensive system of reservoirs, canals, and ditches for irrigation purposes. The chief agricultural products are wheat, oats, barley, Indian corn, peas and beans, potatoes, beets, and carrots; of fruits, there are apples, peaches, plums, apricots, cherries, grapes, etc. Vast quantities of dried fruits are regularly shipped to the East. Though the mountains and more elevated valleys are not susceptible of cultivation, they produce succulent grasses, thus providing excellent ranges for live stock in summer, and in the southern part good ranges also in winter.

The State census report of 1895 shows that in 1894 there were in Utah 19,816 farms with 467,162 acres under cultivation (of which 89·36 per cent. was irrigated), and 294,725 acres under pasture and fenced. The number of laborers employed on these farms was 5,960, and the wages paid them amounted to $1,015,366.

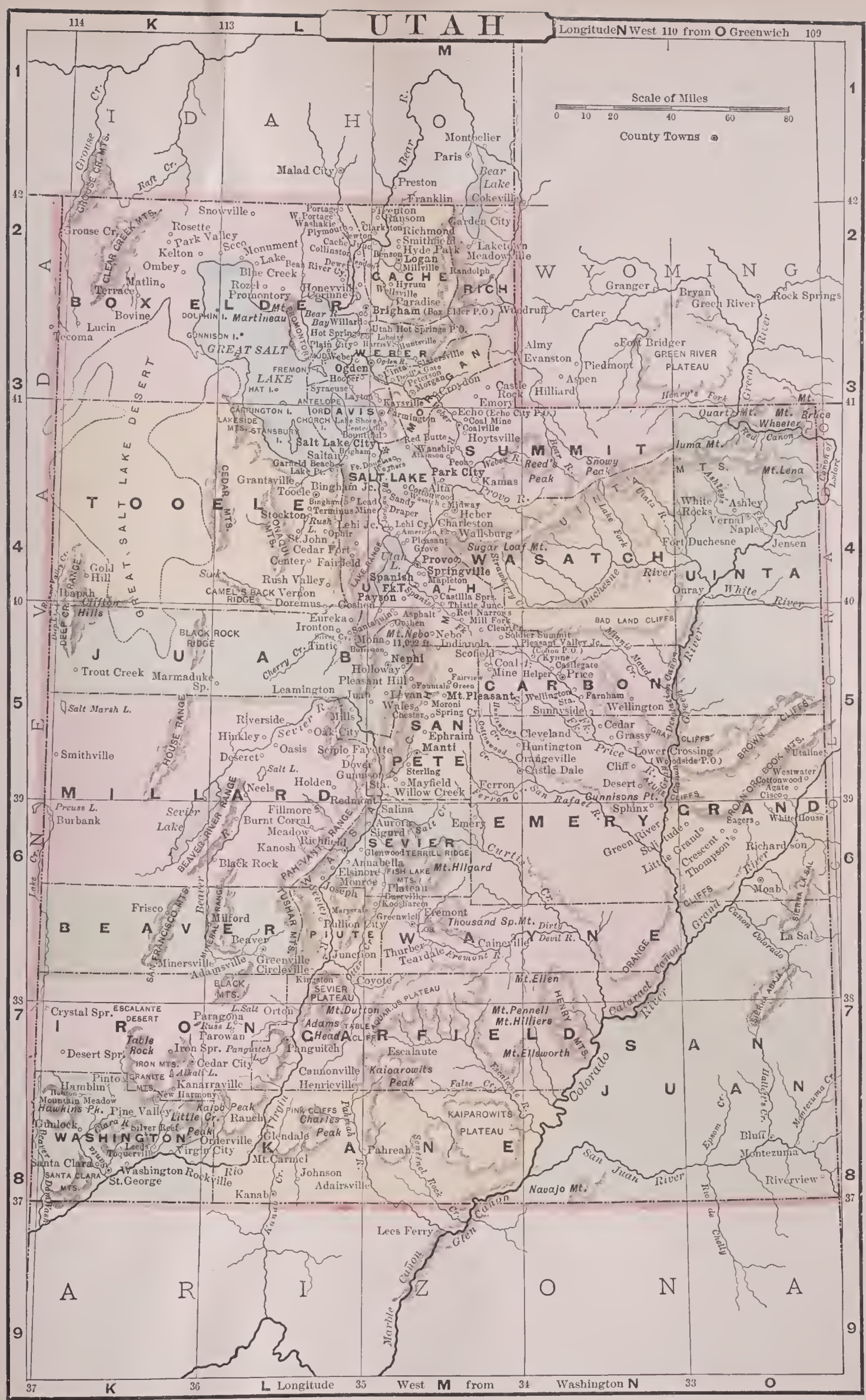
The following table shows the acreage, yield, and value of the principal crops for the year 1900:

CROPS.	Acreage.	Yield.	Value.
Wheat	176,895	3,697,106 bush.	$2,033,408
Corn	8,459	169,180 "	106,583
Oats	25,577	918,214 "	404,014
Barley	5,964	217,686 "	119,727
Rye	3,383	59,202 "	30,785
Potatoes	5,500	649,000 "	311,520
Hay	192,398	509,855 tons	4,053,347
Totals	418,176	.....	$7,059,384

On Jan. 1, 1900, the live stock consisted of 71,710 horses, value $1,547,792; 1,615 mules, value $57,522; 57,209 milch cows, value $1,873,595; 278,867 oxen and other cattle, value $6,396,237; and 2,370,983 sheep, value $6,150,330—total head, 2,780,384; total value $16,025,476.

Minerals.—Next to agriculture the chief industry is mining. Gold, silver, lead, copper, iron, and zinc ores exist in large quantities and in various parts of Utah, and extensive measures of coal are found in Summit and Uinta Counties in the northeast, Sanpete, Carbon, Sevier, and Emery Counties in the central and eastern sections, and in Iron County in the south. The most extensive ledges of iron are in Iron County, though both hematite and magnetite ores exist in other districts. Silver is found in very nearly all the mountains from one end of Utah to the other. The principal gold deposits, whether in placer or in quartz, are in the Oquirrh Mountains, S. W. of Salt Lake City; in the Tintic Mountains, Juab County; in the Camp Floyd district of Tooele County; and along the Green and Colorado rivers. The chief silver-lead mining districts are Park City, Summit County; Tintic, Dugway, and Fish Springs, Juab County; Ophir and Deep creek, Tooele County; Big and Little Cottonwood, Salt Lake County; San Francisco, Beaver County; and Ohio, Piute County. A superior quality of onyx has been found on the west shore of Utah Lake. In addition to the minerals named there are extensive beds of sulphur in Beaver County, alum, borax, gypsum, rock-salt, and asphaltum, the last-mentioned being used largely for paving streets in Salt Lake City. It is also being shipped to Eastern cities. The following is a summary of the mineral production in 1894: Gold, 56,427 fine oz., value $1,128,540; silver, 6,659,798 oz., value $4,193,674; unrefined lead, 55,551,663 lb., value $888,826; refined lead, 202,500 lb., value $62,977; and copper, 1,066,160 lb., value $53,308. Computing the gold and silver at their mint value, and the other metals at their value at the seaboard, shows the total metallic product to have been equal to $11,631,402. Of GILSONITE or asphaltum (not reported in 1894) 3,200 tons, value $90,000, were mined; salt, 108,570 barrels, value $30,075; and sandstone to the value of $136,462. The chief mineral products in 1899 were: silver, 7,093,300 fine oz., valued at $9,171,135; gold, 166,933 fine oz., valued at $3,450,800; copper, 9,584,746 lb.; lead, 29,987 short tons; coal, 786,049 short tons, valued at $997,271; asphaltum (with Colorado), 3,350 short tons, valued at $79,650; sandstone valued at $29,091, and other building stones $14,571.

Climate.—The climate is mild and equable in the valleys, but extremely cold in the winter in the mountains. In the south the snowfall is light. In the northern and middle sections snows come in November and continue until March, or even later, though the depth is seldom great, except in the mountains, where snow is perpetual. The temperature rarely reaches zero in the valleys, and seldom goes above 95°.


UTAH
Longitude West 110 from Greenwich 109
Scale of Miles
0 10 20 40 60 80
County Towns
IDAHO
WYOMING
COLORADO
ARIZONA
NEVADA
BOX ELDER
CACHE
RICH
WEBER
MORGAN
DAVIS
SALT LAKE
TOOELE
SUMMIT
WASATCH
UINTA
DUCHESNE
UTAH
JUAB
CARBON
SAN PETE
EMERY
GRAND
MILLARD
SEVIER
BEAVER
PIUTE
WAYNE
IRON
WASHINGTON
KANE
GARFIELD
SAN JUAN
GREAT SALT LAKE
UTAH L.
Sevier Lake
Salt Marsh L.
Salt L.
Preuss L.
Sink
Mt. Nebo 11,902 ft.
Mt. Hillgard
Thousand Sp. Mt.
Mt. Ellen
Mt. Dutton
Mt. Pennell
Mt. Hilliers
Mt. Ellsworth
Kaiparowits Peak
Navajo Mt.
Mt. Lena
Mt. Bruce
Mt. Wheeler
Uinta Mt.
Snowy Peak
Reed's Peak
Sugar Loaf Mt.
Table Rock
Adams Head
Charles Peak
Kaibab Peak
Little Peak
Hawkins Pk.
Mountain Meadow
Table Mt.
Martineau
Malad City
Montpelier
Paris
Preston
Franklin
Bear Lake
Cokeville
Snowville
Rosette
Park Valley
Kelton
Ombey
Matlin
Terrace
Bovine
Lucin
Tecoma
Grouse Cr.
Grouse Cr. Mts.
Clear Creek Mts.
Raft Cr.
Monument
Blue Creek
Rozel
Promontory
Honeyville
Corinne
Bear R.
Willard
Hot Springs
Plain City
Ogden
Hooper
Syracuse
Layton
Kaysville
Farmington
Bountiful
Salt Lake City
Saltair
Garfield Beach
Grantsville
Tooele
Bingham Jc.
Stockton
Rush L.
Lehi Jc.
St. John
Ophir
Cedar Fort
Center
Fairfield
Rush Valley
Vernon
Doremus
Goshen
Eureka
Ironton
Mona
Tintic
Nephi
Holloway
Leamington
Juab
Levan
Mt. Pleasant
Riverside
Hinkley
Oasis
Deseret
Oak City
Scipio
Fayette
Dover
Gunnison
Sta.
Holden
Redmond
Salina
Aurora
Sigurd
Richfield
Kanosh
Black Rock
Annabella
Elsinore
Monroe
Joseph
Plateau
Fremont
Marysvale
Junction
Thurber
Teardale
Greenville
Circleville
Minersville
Adamsville
Frisco
Milford
Beaver
Crystal Spr.
Paragona
Parowan
Iron Spr.
Cedar City
Desert Spr.
Pinto
Hamblin
Kanarraville
New Harmony
Pine Valley
Gunlock
Silver Reef
Leeds
Toquerville
Virgin City
Santa Clara
Washington
St. George
Rockville
Rio
Mt. Carmel
Kanab
Johnson
Adairsville
Glendale
Orderville
Pahreah
Escalante
Henrieville
Panguitch
Orton
Kingston
Coyote
Cannonville
Lees Ferry
Marble Canyon
Glen Canyon
Cataract Canyon
Colorado River
San Juan River
Green River
Grand River
Dirty Devil R.
Fremont R.
Escalante R.
False Cr.
Sentinel Rock
Pink Cliffs
Kaiparowits Plateau
Escalante Desert
Great Salt Lake Desert
Bear R.
Weber R.
Provo R.
Duchesne River
White River
Uinta R.
Lake Fork
Henry's Fork
Green River
Price R.
Gunnisons Pt.
Bad Land Cliffs
Gray Cliffs
Brown Cliffs
Roan or Book Mts.
Sierra La Sal
Sierra Abajo
Bryan
Green River
Rock Springs
Granger
Carter
Fort Bridger
Green River Plateau
Almy
Evanston
Piedmont
Aspen
Hilliard
Castle Rock
Emory
Echo
Coalville
Hoytsville
Wanship
Peoa
Park City
Kamas
Alta
Midway
Heber
Charleston
Wallsburg
Provo
Springville
Mapleton
Spanish Fork
Payson
Castilla Sprs.
Thistle Junc.
Red Narrows
Mill Fork
Soldier Summit
Pleasant Valley Jc.
Scofield
Coal Mine
Helper
Price
Castlegate
Kyune
Farnham
Wellington
Sunnyside
Cedar
Grassy
Cleveland
Huntington
Orangeville
Castle Dale
Ferron
Cliff
Desert
Lower Crossing
Sphinx
Westwater
Cottonwood
Agate
Cisco
Moab
La Sal
Richardson
Thompson's
Crescent
Little Grand
Solitude
Green River
Ouray
White Rocks
Vernal
Naples
Jensen
Fort Duchesne
Bluff
Montezuma
Riverview
Utalinet
Gold Hill
Ibapah
Clifton
Deep Cr. Range
Black Rock Ridge
Camel's Back Ridge
House Range
Beaver River Range
Pahvant Range
Tushar Mts.
Wasatch Range
Uinta Mts.
Cedar Mts.
Iron Mts.
Granite Mts.
Santa Clara Mts.
Trout Creek
Marmaduke Sp.
Smithville
Burbank
Neels
Fillmore
Burnt Corral
Meadow
Black Mts.
Frisco
Minersville
Adamsville
Greenville
Circleville
Crystal Spr.
Desert Spr.
Pinto
Hamblin
Gunlock
Santa Clara
Washington
St. George
Rockville
Kanab
Lees Ferry
Bluff
Montezuma
Riverview
Navajo Mt.
Escalante Desert
Table Rock
Iron Spr.
Cedar City
Kanarraville
New Harmony
Pine Valley
Virgin City
Orderville
Glendale
Mt. Carmel
Johnson
Adairsville
Rio
Rockville
Kanab
Escalante
Henrieville
Panguitch
Orton
Kingston
Coyote
Cannonville
Lees Ferry
Marble Canyon
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Cataract Canyon
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Evanston
Piedmont
Aspen
Hilliard
Castle Rock
Emory
Echo
Coalville
Hoytsville
Wanship
Peoa
Park City
Kamas
Alta
Midway
Heber
Charleston
Wallsburg
Provo
Springville
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Castilla Sprs.
Thistle Junc.
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Mill Fork
Soldier Summit
Pleasant Valley Jc.
Scofield
Coal Mine
Helper
Price
Castlegate
Kyune
Farnham
Wellington
Sunnyside
Cedar
Grassy
Cleveland
Huntington
Orangeville
Castle Dale
Ferron
Cliff
Desert
Lower Crossing
Sphinx
Westwater
Cottonwood
Agate
Cisco
Moab
La Sal
Richardson
Thompson's
Crescent
Little Grand
Solitude
Green River
Ouray
White Rocks
Vernal
Naples
Jensen
Fort Duchesne
Bluff
Montezuma
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Utalinet
Gold Hill
Ibapah
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Pahvant Range
Tushar Mts.
Wasatch Range
Uinta Mts.
Cedar Mts.
Iron Mts.
Granite Mts.
Santa Clara Mts.
Trout Creek
Marmaduke Sp.
Smithville
Burbank
Neels
Fillmore
Burnt Corral
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Black Mts.
Frisco
Minersville
Adamsville
Greenville
Circleville
Crystal Spr.
Desert Spr.
Pinto
Hamblin
Gunlock
Santa Clara
Washington
St. George
Rockville
Kanab
Lees Ferry
Bluff
Montezuma
Riverview
Navajo Mt.
Escalante Desert
Great Salt Lake

The accompanying table shows the mean temperature and the rainfall at the station of the Utah Weather Service, Salt Lake City, during 1894:

MONTHS.	Mean temperature.	Precipitation.	MONTHS.	Mean temperature.	Precipitation.
January	29° F.	1·31 in.	July	75° F.	·82 in.
February	26	·83	August	75	·87
March	41	1·73	September	61	2·87
April	48	1·67	October	53	1·01
May	61	1·22	November	46	·28
June	64	1·38	December	31	1·28

Divisions.—For administrative purposes Utah is divided into twenty-seven counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Beaver	7-K	3,340	3,613	Beaver	1,701
Boxelder	2-K	7,642	10,009	Brigham	2,859
Cache	2-L	15,509	18,139	Logan	5,451
Carbon †	5-N	.....	5,004	Price	539
Davis	3-L	6,751	7,996	Farmington	968
Emery	6-N	5,076	4,657	Castle Dale	559
Garfield	8-M	2,457	3,400	Panguitch	883
Grand	6-O	541	1,149	Moab	.....
Iron	7-K	2,683	3,546	Parowan	1,039
Juab	5-K	5,582	10,082	Nephi	2,208
Kane	8-L	1,685	1,811	Kanab	710
Millard	6-K	4,033	5,678	Fillmore	1,037
Morgan	3-M	1,780	2,045	Morgan	600
Piute	7-L	2,812	1,954	Junction	249
Rich	2-M	1,527	1,946	Randolph	821
Salt Lake	4-L	58,457	77,725	Salt Lake City	53,531
San Juan	8-N	365	1,023	Monticello	.....
Sanpete	5-M	13,146	16,313	Manti	2,408
Sevier	6-M	6,199	8,451	Richfield	1,969
Summit	3-M	7,733	9,439	Coalville	808
Tooele	4-K	3,700	7,361	Tooele	1,200
Uinta	4-O	2,762	6,458	Ashley	.....
Utah	4-L	23,768	32,456	Provo City	6,185
Wasatch	4-N	3,595	4,736	Heber	1,534
Washington	8-K	4,009	4,612	St. George	1,600
Wayne †	6-M	.....	1,907	Loa	.....
Weber	3-L	22,723	25,239	Ogden	16,313
Totals	.....	207,905	276,749		

* Reference for location of counties, see map of Utah.
† Organized since 1890.

Principal Cities and Towns.—Salt Lake City, 53,531; Ogden, 16,313; Provo City, 6,185; Logan, 5,451; Park City, 3,759; Springville, 3,422; Eureka, 3,085; Brigham, 2,859; Spanish Fork, 2,735; American Fork, 2,732; Payson, 2,636.

Population and Races.—In 1850, 11,380; 1870, 86,786; 1880, 143,963; 1890, 207,905; 1895, 247,324—of whom 194,825 were native born, 52,499 foreign born, 126,803 males, 120,521 females, 245,985 whites, 571 colored, and 768 Chinese.

Industries and Business Interests.—Manufactures were early stimulated by the necessities of the people, owing to the distance from manufacturing centers and the cost of transporting goods by ox and horse teams from the Missouri river. Before the advent of railways woolen and cotton mills, tanneries, foundries, and machine-shops had been established and were in successful operation, and most of these industries have been developed since in greater or less degree. The State census of 1895 shows that during 1894 880 manufacturing establishments were in operation. The aggregate capital was $5,476,246; 5,054 persons were employed, to whom $2,027,118 was paid in wages. The establishments used materials that cost $2,640,038, and turned out goods valued at $6,678,118. There is an extensive woolen-mill at Provo City, another at Salt Lake City, one at Beaver, and a fourth at Brigham. A large beet-sugar factory is in successful operation at Lehigh. There are numerous silver-lead smelters and gold and silver reduction-mills in the Salt Lake valley and in the mining districts, most of the gold, silver, and lead ores produced in Utah being reduced at home. At Salt Lake City is a copper reduction and manufacturing plant which cost over $500,000, and near the city are extensive lead-refining and pipe-works.

Finance.—The treasurer's report for December, 1900, was: balance Dec. 1, $202,208.02; receipts from tax collections and land sales, $588,672.85; total, $790,880.87. The total disbursements were $237,910.97, leaving a balance Dec. 31, 1900, of $552,969.90. The assessed valuation in 1899 was $99,713,499; in 1900 it was $105,629,041. Of the increase $1,200,000 was in the value of real estate, $1,400,000 in improvements, $1,500,000 in personal property, and $1,900,000 in corporation property.

Banking.—On Sept. 5, 1900, there were 10 national banks with a combined capital of $1,600,000, surplus and profits of $672,142.77, and individual deposits of $5,071,629.89; on June 30, 20 State banks, capital $2,200,000, surplus and profits $7,930,687, and deposits $17,434,051; and 9 stock savings-banks, capital $606,800, surplus and profits $90,450, and $2,252,124 in savings deposits from 6,522 depositors.

Post-offices and Periodicals.—In Jan., 1901, there were 348 post-offices, of which 15 were presidential (1 first-class, 2 second class, 12 third-class) and 333 fourth-class; 144 were money-order offices, and 7 money-order stations. The newspapers and periodicals (1901) comprised 5 daily, 1 tri-weekly, 6 semi-weekly, 51 weekly; 3 semi-monthly, and 7 monthly publications—total 73.

Means of Communication.—The northern and middle divisions are well supplied with railways. The Union and Central Pacific cross Utah from east to west; the Rio Grande Western, connecting with the Colorado system of roads on the eastern border, extends to Ogden; the Union Pacific operates a north and south line from Frisco, 236 miles S. of Salt Lake City, into Idaho, Montana, and Oregon; and there are short lines running from Salt Lake City and the trunk roads into the mining districts, as the Utah Central to Park City, 31 miles; the Echo and Park City, 28 miles; the Tintic mining-district branches of the Union Pacific and Rio Grande Western, the Sanpete valley, and the Sevier valley branches. In 1899 the total mileage of railways was 1,494·75. There were also more than 100 miles of street-railway, principally in Salt Lake City, Ogden, and Provo City.

Churches.—The majority of the people are Mormons, or Latter-day Saints, as they call themselves. They own numerous and many of them large, costly, and imposing church edifices called temples, tabernacles, stake-houses, chapels, and meeting-houses. The temples, of which there are four magnificent structures, viz., at Salt Lake City, Logan, Manti, and St. George, are not used for public services, but in them are performed the secret rites of the church. None but members are permitted to enter these buildings. The tabernacles and other church buildings number about 200, with a seating capacity of 75,000, and are for public worship. Among the other denominations which have organizations in Utah, most of them having church edifices and resident ministers in the cities, are the Advent, Baptist, Roman Catholic, Christian, Christian Scientist, Congregational, Disciples of Christ, Jewish, Lutherans, Methodist Episcopal, African Methodist, Presbyterian, Protestant Episcopal, Salvation Army, and Spiritualist.

Schools.—Utah has an excellent system of free schools, supported by general and local taxation, and good schools are maintained for nine or ten months of the year. Besides the public schools there are many mission and private schools, the former maintained by the evangelical churches. The University of Utah, at Salt Lake City, is supported by direct appropriation from the State treasury, and the Agricultural College, at Logan, is supported in part by the State and in part by the U. S. Both are free in the matter of tuition. In 1899 there were 689 schools, and 1,419 teachers. Of the 84,419 children of school-age, 71,906 were enrolled and 52,208 in attendance. The school revenues were $1,066,544; the expenditures, $991,973.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, Utah had 9 libraries, containing 37,993 bound volumes and 5,473 pamphlets. The libraries were classified as follows: General, 6; school, 2; society, 1.

Charitable, Reformatory, and Penal Institutions.—The penitentiary at Salt Lake City belongs to the U. S., and is maintained and controlled by the Federal authority. There is a reform school for youth at Ogden, and an asylum for the insane at Provo. Salt Lake, Weber, Cache, and Utah Counties have each a house and farm for the indigent.

Political Organization.—The government of the State is that provided in the constitutional convention held at Salt Lake, May 4–6, 1895, ratified by the people at the general election, and approved by the President of the U. S. in his proclamation admitting Utah to the Union Jan. 4, 1896. The legislative branch consists of a Senate of eighteen members and a House of Representatives of forty-five members, both chosen for two years, and holding sessions biennially. They are all chosen by popular vote, men and women over twenty-one years of age having equal electoral rights. The Governor, Secretary of State, State Treasurer, Attorney-General, and Superintendent of Public Instruction are elected for four years and must reside at the seat of government

during their term of office. As compensation the Governor and Secretary of State each receive $2,000 per annum, the State Auditor, the Attorney-General, and the Superintendent of Public Instruction $1,500, and the State Treasurer $1,000. The judicial power of the State is vested in the Senate, a Supreme Court of three members, each of whom receives $3,000 per annum, seven district courts, and justices of the peace. Education is free and unsectarian and open to all the children of the State. Polygamous or plural marriages are prohibited, but absolute freedom of conscience is guaranteed. The public debt must not exceed $200,000 over and above the territorial indebtedness assumed by the State.

History.—Utah was settled by the Mormons in 1847, when it was Mexican territory. Owing to the impossibility of living at peace in Missouri and Illinois, Brigham Young, the president of the church, led his people W. into the wilderness, the first band, numbering 143, arriving in the Salt Lake valley July 24, 1847. Since then Utah has been the gathering-place and headquarters of the Mormon people. For two years there was no secular government. In 1849 a constitution was formulated and the provisional government of the state of Deseret went into operation with a full quota of state officials. In 1850 Utah was organized into a Territory of the U. S., but the new government did not go into effect until the following year. An unfortunate incident in the history of Utah was the Mountain Meadow massacre, in which 120 men, women, and children were murdered by a band of Indians under Mormon leadership Sept. 15, 1857. A party of emigrants, numbering about 140, were passing through Utah on their way to California when they were suddenly attacked at Mountain Meadow in the northern part of Washington County. Though taken completely by surprise they kept their assailants at bay for five days, but were induced by two of the Mormons, John D. Lee and Isaac Haight, to lay down their arms and return to the East on the understanding that their lives would be spared. Guided by Lee and Haight the emigrants started on their return journey, but the attack was renewed from an ambush, and all but seventeen were killed. For many years the crime was charged to the Indians, but the complicity of the Mormons was brought to light in 1874, and an investigation was ordered by the U. S. Government. Lee was arrested and tried for the offense in 1875, and on Mar. 23, 1877, was executed at the place where the massacre was committed. In 1857 the U. S. Government sent an army into Utah, it being alleged that the Mormon leaders were assuming and exercising power and authority unlawfully, and interfering with the administration of justice by the Federal courts. The Mormon militia was mobilized, and, opposing the army on the eastern border, prevented the troops from reaching Salt Lake valley until the spring of 1858. There was no actual collision between the opposing forces, but the militia burned some Government supply-trains, and so hampered and annoyed the troops as to prevent an advance beyond Fort Bridger on the eastern border. In 1862 Congress passed a bill to punish those guilty of polygamy, yet for years thereafter little effort was made to enforce the law. In 1882 another and more drastic act was passed against the practice, which had been continued openly until that time, and in 1887 Congress passed a bill greatly restricting suffrage and escheating most of the vast property of the Mormon church, including both real estate and personality. The act of 1882 was the work of Senator George F. Edmunds, and was upheld by the Supreme Court in decisions that were rendered in 1884 in a series of five cases. From 1885 to 1890 there was persistent warfare against the polygamists in the courts, and in Oct., 1890, after more than 1,100 of their men had served terms in the penitentiary, the people voted in general conference to sustain the proclamation or "manifesto" issued a month previously by their president, discontinuing the practice of polygamy.

GOVERNORS OF UTAH.

Territorial.	
Brigham Young	1850–54
Edwin J. Steptoe	1854–57
Alfred Cumming	1857–61
Stephen S. Harding	1861–64
James J. Doty	1864–65
Charles Durkee	1865–69
J. Wilson Shaffer	1870–71
George L. Woods	1871–73
Samuel B. Axtell	1873–75
George W. Emery	1875–80
Eli H. Murray	1880–86
Caleb W. West	1886–89
Arthur L. Thomas	1889–93
Caleb W. West	1893–96
State.	
Heber M. Wells	1896–

See *History of Utah*, by H. H. Bancroft (San Francisco, 1888). BYRON GROO.

Utah Lake: the largest body of fresh water in Utah; N. lat. 40° 15′, W. lon. (from Greenwich) 111° 45′. Its altitude above the sea is 4,500 feet; its length from N. to S. is 25 miles; its extreme width 13 miles; its area 150 sq. miles. The valley in which it lies is part of a great trough formed by the uplift of the Wasatch range of mountains at the E. and the Oquirrh, Lake, and Tintic ranges at the W. The eastern range is the loftier, and all the tributaries of the lake come from that side. Corn creek, Hobble creek, and the American Fork rise in the Wasatch Mountains, but the Spanish Fork and Provo river head to the E. of the range, and pass through it in deep defiles. Its outlet is the river JORDAN (*q. v.*). The water contains ·00030 of mineral matter, of which ·00018 is calcium sulphate. G. K. G.

Ute Indians: See SHOSHONEAN INDIANS.

Uterine Diseases [*uterine* is from Lat. *u'terus*, womb]: diseases of the womb or uterus (including also the derangements of its various appendages); the so-called "female diseases." Diseases of this kind are comparatively infrequent in the women of aboriginal and savage tribes, and in civilized races among the women of rural districts who labor, are much in the open air, and are free from artificial and debilitating habits of dress and living. The predisposing causes of a majority of all uterine diseases are the constant recurrence of the menstrual periods during the greater part of adult life, the complications and sequelæ of child-bearing, and the intimate nervous and vascular sympathy which connects the uterus with every other part of a woman's organism. The uterus itself is subject to congestion and to inflammation from many causes, as suppressed menstruation, catching colds, falls, blows upon the abdomen. Congestion and inflammation are indicated by a sense of fullness, weight, warmth, and pain, with tenderness on pressure in the lower part of the abdomen, especially in standing or walking. The disease may be limited to the inner mucous membrane, to the body of the organ, or the exterior investing loose tissue, or rarely it may involve all. The term metritis denotes inflammation of the body proper of the organ, endo-metritis of the mucous interior, peri-metritis of the surrounding tissues. This tissue, when extensively inflamed, is often infiltrated with new plastic matter, the product of the vascular engorgement, and this, becoming set, fixes the uterus for a time, so that it is rigid and immovable—a condition termed pelvic peritonitis. This loose tissue is occasionally the seat of profuse hæmorrhage from a ruptured vessel, as in lifting, jumping, or falling. The effused blood gravitates in the pelvis, and the blood-tumor, termed pelvic hæmatocele, often presents in the vagina.

The normal uterus is a symmetrical organ, with a straight axis, and the cavity of its body and neck slightly open; its normal position is that of slight anteversion, or upright and from above inclining slightly backward. But attacks of congestion and inflammation change its shape, size, symmetry, and position. Thus, either from external pressure or adhesions, or from softening or thickening of its own walls, it may be drawn down, backward, forward, or to either side; the organ as a whole may be tilted, giving rise to version, or the body may be bent on the neck, a condition termed flexion. According to the direction which the displacement or deformity of the uterus takes, it is called anteversion, retroversion, right and left lateral version, and anteflexion, retroflexion, and right and left lateral flexion. Flexions of the uterus are a common cause of dysmenorrhœa, or difficult and painful menstruation, since by the bending of the uterus its canal is bent and constricted, and the free escape of menstrual blood is prevented; this flexion of the uterine canal is also a cause of sterility, since seminal elements can not enter the organ and produce conception. Whenever the uterus is enlarged, as by congestion or inflammation, is the seat of a polypus or tumor, or is pressed down by growths in the cavity of the abdomen, and also whenever in debilitated persons its ligaments and outside supports are weakened and relaxed, it tends to gravitate below its natural position in the pelvis, and even to project from the body. This falling of the womb is termed prolapse, and, when extreme, procidentia. The lower end of the uterus, the neck or cervix, is often ulcerated as the result of congestion, inflammation, contact of its end with the floor of the pelvis, and the irritation of the acrid mucus discharged in endo-metritis. Tumors may develop within the cavity of the uterus, in the substance of its walls, or upon its outer surface, either beneath its serous coverings or loosely attached by pedicles. The uterus is often the seat of cancer, especially at the "change of life." The

ovaries are subject to congestion, inflammation, hæmorrhage, and intense neuralgia. The fibrous framework of these organs may increase and develop fibrous tumors; but especially frequent and important are ovarian cysts. The ovisac becomes distended with fluid in order to rupture and eject the ovule; it is then filled by the serum of the coagulated blood from the hæmorrhage consequent upon the rupture. The ovisac is liable to fill, and by a process of vascular activity and growth in its wall become a cyst of greater or less size; cysts may be present of small size and in numbers, never attracting attention, or reversely, grow either by secretion or dropsical transudation to contain 10, 20, 60, or more pounds of serous fluid. Such ovarian cysts may be single sacs, or be divided by partitions into compartments. The latter are more common, the single-celled cysts springing rather from the parovarium, a remnant of fœtal life. The vagina is frequently the seat of catarrhal inflammations, causing a discharge termed LEUCORRHŒA (*q. v.*). It may also be acutely inflamed (vaginitis), or it may be the seat of ulcers, and also of spasm, with or without pain, a condition termed vaginismus. This passage is, very exceptionally, anatomically defective, being wholly or partially wanting or constricted. The most common of all uterine diseases are merely functional derangements or irregularities of menstruation. By amenorrhœa is understood absence of menstruation; dysmenorrhœa is characterized by pain, sickness, and deficient flow at the period; and menorrhagia is a prolonged and excessive menstrual flow, or persistent loss of blood from the uterus, as when cancer or polypus exists. In the treatment and cure of uterine diseases correct diagnosis is essential at the outset. Most of them are benefited by use of general tonics, by rest, corrected habits, and by supporting the abdominal viscera; but many are not even alleviated by these general measures. Physical exploration, both manual and by aid of the speculum, will often reveal an unsuspected disease, and point to the special topical treatment or surgical procedure which is the essential means of cure. Revised by WILLIAM PEPPER.

U'tica: an ancient city of Africa; on the river Bagradas, near its entrance into the Mediterranean, occupying the site of the modern village of Duar. When Carthage was taken and destroyed by the Romans, Utica rose in importance and became the capital of the Roman province. The remains of its temples, amphitheater, and aqueduct show that it must have been a magnificent place. In the latter part of the seventh century it was taken and destroyed by the Arabs.

Utica: city; capital of Oneida co., N. Y.; on the Mohawk river, the Erie Canal, and the Del., Lack. and W., the N. Y. Cent. and Hud. R., the N. Y., Ont. and W., the Rome, Water. and Ogdens., the Utica, Ch. and Susquehanna Val., and the W. Shore railways; 53 miles E. of Syracuse, and 96 miles W. of Albany (for location, see map of New York, ref. 4-H). It is built on the slope of a hill, about 500 feet above sea-level, and has 13 public squares and parks with fountains and other adornments. The surrounding country is devoted principally to dairying. General agriculture and the cultivation of roses are carried on extensively. The city is the chief cheese-market in Central New York. Water is supplied by a private corporation having a capital of $500,000. There are 74 miles of mains and a reservoir with a daily capacity of 4,000,000 gal. Utica is lighted by gas and electricity, and has a system of electric street-railway with over 25 miles of track. The public buildings include a U. S. Government building, city-hall, a State armory, public library, and Y. M. C. A. building. Forest Hill Cemetery is a place of much artistic beauty.

Churches, Schools, and Charities.—There are 47 churches, divided denominationally as follows: Protestant Episcopal, 7; Presbyterian, 6; Roman Catholic, 6; Methodist Episcopal, 5; Evangelical Lutheran (German), 5; Baptist, 4; Welsh, 3; Evangelical Lutheran (English), 2; Congregational, 2; Moravian, 2; Universalist, 2; Jewish, 2: and Reformed, 1. The total estimated value of church property is $1,562,500, and the total church membership is 28,135. The public schools have an enrollment of 7,705 pupils, and in 1894 cost for maintenance $124,047. There are 22 ward schools, a training-school with a normal department, and an academy for higher education. Of private schools there are 14, at the head of which is Mrs. Piatt's female seminary. The charitable institutions number 16, and include the State, City, St. Luke's, Homœopathic, and Faxton hospitals, Home for the Homeless, Home for the Aged, Utica Orphan Asylum, St. Vincent's Protectory, and a Masonic Home. The benevolent institutions have real estate valued at over $1,500,000. Utica is known as the "City of Charities."

Business Interests.—The census returns of 1890 showed that 473 manufacturing establishments in Utica reported. These represented 72 industries, had $12,257,855 capital, employed 11,416 persons, paid $3,535,130 for wages and $6,582,234 for materials, and had a combined output valued at $13,205,572. The principal industries, according to amount of capital employed, were the manufacture of cotton goods, $2,894,859; men's clothing, $2,655,888; and boots and shoes, $753,932. In 1895 the value of the manufacturing output was estimated at over $17,000,000. The cotton and woolen mills in the city use upward of 30,000 bales of cotton annually, and the New York Mills, 3½ miles distant, use about 8,500 bales. The annual output of beer is over 94,000 barrels. Other manufactures are canned goods, furnaces, iron pipe, furniture, agricultural implements, steam-gauges, oilcloth, varnish, hosiery, trunks, and gas fixtures. In 1895 there were 4 national banks with combined capital of $1,500,000, 2 State banks with capital of $325,000, and a savings-bank with surplus of $1,103,722 and deposits of $5,543,764; and 3 daily, 2 semi-weekly, 7 weekly, and 6 monthly periodicals.

History.—The site of the city was known in early days as Old Fort Schuyler, from the fort or block-house erected at the fording-place over the Mohawk river, near the present intersection of Second Street and the railway. The site was taken from a tract of 22,000 acres given by the king to William Crosby, the colonial governor, in 1734, which became known as Crosby's manor. The place was settled by immigrants from England and New England; was incorporated as a village Apr. 3, 1798; and was chartered as a city Feb. 13, 1832. Pop. (1880) 33,914; (1890) 44,007; (1900) 56,383. CHARLES S. SYMONDS.

Utilita'rianism [from Lat. *uti'litas*, usefulness, profit, deriv. of *u'tilis*, useful, deriv. of *u'ti*, to use]: the doctrine that the object of all moral conduct is to subserve utility. The theory has played historically a great *rôle* in the development of ethical thought. It began in the Greek moralists, who identified the supreme good—the *Summum Bonum*—with happiness. In modern times the home of utilitarianism has been England, where the school of English utilitarians has pressed the theory with great force and refined it with great ingenuity. The British development may be said to have begun with Locke, although Locke's influence was exerted rather through the general bearings of his philosophy than through his direct ethical teachings. Then follow the names of Hobbes, Hume, James Mill, John Stuart Mill, Bentham, Bain, Spencer, Stephen, and Sidgwick.

The doctrine itself has passed through several interesting phases, all inspired by the criticism of the intuitional moralists, who argued that the most conspicuous thing about moral conduct is just the fact that it is disinterested—i. e. not done with view to utility. The postulate of "general utility," or "the greatest good of the greatest number," came to be substituted for the happiness of the private individual; and in this way Bentham and the elder Mill sought to do justice to the demand that morality should have an altruistic ingredient. The point is made in opposition to such a formulation of the ethical end that there is no way of telling what the greatest happiness of the greatest number is except by judging of the happiness of the individual.

Another attempt to put utilitarianism above the criticism of being egoistic is that of Stuart Mill, who distinguished between the lower or more physical enjoyments to which the word "pleasure" applies and the higher or more spiritual to which the word "happiness" should be restricted. It is in recognition, in the main, of this distinction that the school of utilitarian thinkers is divided into two wings—i. e. the Hedonists, or lower-pleasure men, and the higher-pleasure men called Eudæmonists. Mills's distinction is open, however, to the criticism often brought against it that it affords no criterion of distinction between the two classes of enjoyments. For to distinguish between them on grounds other than those of utility is to give up the utility formula.

Yet a further turn has been given to the discussion by those—notably Leslie Stephen—who have endeavored to save the utility doctrine by a view of society which makes the "organic development" of "social tissue" the ultimate end of human progress, and endeavors to show that under this conception all of the earlier formulas may be brought. Writers who still consent to call themselves utilitarian are seeking to work out on some such basis of social and political theory a new and more adequate view.

The need of a reconstruction in view of the newer work in social psychology is emphasized by the advances in the theory of evolution and its application of social problems. The critical point in the historical development of utilitarianism, as indeed of all ethical theories, has been the uncertainty attaching to the relation of the individual's welfare and happiness to that of society and the race. So long as no social psychology existed it was impossible to tell how far the gratification of self might tend to subserve the larger utilities of society also. Is there a real antagonism between egoism and altruism?—between the welfare of the individual and that of the social organism of which the individual is an integral part? How can there be such a conflict if it be true, as the evolution doctrine declares, that both are incidents of a common progress? It may well be—and this is what current theories are beginning to teach—that the evolution of the individual could never have taken on a social phase or have acquired its own highest plane, if the very statement of its goal had not come to include those social values which in their operation subvert, and in their presence in consciousness conceal, the more individualistic sources from which they sprang. On some such basis as this it may yet come to pass that a new utilitarianism may be erected upon these very instincts of social and anti-egoistic value to which the opponents of the older utilitarianism made their appeal.

The later adherents of idealistic philosophy have seen in a measure the value of a deeper synthesis of doctrines on this subject, and have tried to work out a formula. In their phrase "self-realization" is the ethical end, and the definition of self-realization is made wide enough to include the altruistic impulse. Here we may class Green in England, and his later representative, Edward Caird, together with the general school of thinkers who follow in the footsteps of Hegel. They have failed, however, to work out a consistent concrete statement, being generally led astray by verbal and logical distinctions. Their work, while aiming at a profounder grounding of egoism and altruism in race progress, has had no adequate social psychology to rest upon. See MORAL PHILOSOPHY, HEDONISM, and INTUITIONALISM.

REFERENCES.—Mill, *Utilitarianism*; Sidgwick, *History of English Ethics* and *Methods of Ethics* (4th ed.); Martineau, *Types of Ethical Theory*; Stephen, *Science of Ethics*.
J. MARK BALDWIN.

Uto'pia [= Mod. Lat., liter., nowhere; Gr. οὐ, not + τόπος, place]: an imaginary island, the abode of a people free from care, folly, and the common miseries of life, described by Sir Thomas More in his political romance *De Optimo Reipublicæ Statu, deque Nova Insula Utopia* (Louvain, Antwerp, and Paris, 1516); translated from the Latin by Robynson (1551; 2d ed. 1556; reprinted 1880), by Burnet (1683), and by Cayley (1808).

U'traquists: a Hussite sect, deriving their name from the fact that they demanded the Lord's Supper administered to them *sub utraque specie*—that is, in both bread and wine. They were also called Calixtines, from *calix*, chalice. The execution of Huss at Constance created an immense excitement in Bohemia, and brought about a complete breach between his adherents and the Church of Rome. In the so-called Four Articles of Prague the Utraquists set forth their demands—freedom of preaching, communion under both kinds, the reduction of the clergy to apostolic poverty, and severe punishment of all open sins. The war was very bloody, but successful; and it was simply the internal split in the Utraquist party which finally gave the victory to the Romanists. By the compacts of Iglau the pope yielded only the one point of the Prague articles, communion under both kinds. Revised by S. M. JACKSON.

Utrecht, yu'trekt: province of the Netherlands, bounded N. by the Zuyder-Zee and S. by the Rhine and Leck; area, 534 sq. miles. The surface is diversified by low hills along the Rhine, the soil is very fertile, and the climate drier and brighter than in the other provinces. Wheat, barley, oats, and tobacco are extensively cultivated; cattle and sheep are reared; and several branches of manufactures, such as the making of tiles, bricks, and pottery, are practiced on a large scale. Pop. (1899) 251,034, of whom about 30 per cent. are Roman Catholics and the rest Protestants.

Utrecht: capital of the province of Utrecht; on the Old Rhine, where the Vecht branches off from it, 23 miles S. S. E. of Amsterdam (see map of Holland and Belgium, ref. 6–F). It is strongly fortified, is well built, traversed by canals, and surrounded with finely planted promenades, has two cathedrals, and, among other educational institutions, a celebrated university, founded in 1634, with which are connected a botanical garden, a chemical laboratory, an observatory, and different museums and scientific collections. Its manufactures of plush, velvet, and carpets, of leather, soap, salt, and brandy, of metal ware and cigars, are very extensive, and it carries on an active trade in grain, cattle, and its own manufactures. It is probably the oldest town of the Netherlands, called by the Romans *Trajectum ad Rhenum* or *Ultrajectum*, from which latter appellation its present name is derived. Here the fusion between the seven provinces which formed the Dutch republic was organized in 1579, and here the treaty was signed (Apr. 11, 1713) between France, England, Holland, Prussia, Portugal, and Savoy, which ended the war of the Spanish succession. Pop. (1899) 102,040. Revised by M. W. HARRINGTON.

Utre'ra: town; in the province of Seville, Spain (see map of Spain, ref. 19–D). It is well built and pleasant; has several oil-mills and manufactures of soap, leather, and pottery; and is in a rich and beautiful district, famous for its excellent horses and ferocious bulls. Pop. 15,000.

Utricula'ria: a genus of plants represented by the BLADDERWORT (*q. v.*). See also INSECTIVOROUS PLANTS.

Uttara-mīmāṅsā: See MĪMĀṄSĀ and VEDANTA.

Uvalde: town; capital of Uvalde co., Tex.; on the S. Pac. Railroad; 92 miles W. by S. of San Antonio (for location, see map of Texas, ref. 5–F). It is in an agricultural, asphalt-mining, and stock-raising region, and has 7 churches, separate public schools for white and colored children, Leona Springs, several sawmills, a national bank (capital $50,000), a private bank, and 2 weekly papers. Pop. (1880) 794; (1890) 1,265; (1900) 1,889. EDITOR OF "NEWS."

Uvic Acid: See RACEMIC ACID.

Uvula: See PALATE.

Uxbridge: post-village, Ontario County, Ontario, Canada; on Black river, and Midland Division of Grand Trunk Railway; 43 miles N. N. E. of Toronto (see map of Ontario, ref. 4–E). It has important manufactures of iron castings, engines, mill-machinery, plows, axes, leather, woolens, and other articles. Pop. (1891) 2,023.

Uxbridge: town; Worcester co., Mass.; on the Blackstone river, and the N. Y., N. H. and Hart. Railroad; 20 miles S. E. of Worcester (for location, see map of Massachusetts, ref. 3–F). It contains the villages of Uxbridge, Uxbridge Center, North Uxbridge, Calumet, Hecla, Wheelock's, Scott's, and Rivulet; was formerly the western part of Mendon; was set off and incorporated under its present name in 1727, and its northern part was set off under the name of Northbridge in 1772. There are 5 churches, 18 public schools, free public library, several cotton and woolen mills, a national bank with capital of $100,000, a savings-bank, and a weekly newspaper. Pop. (1880) 3,111; (1890) 3,408; (1900) 3,599. EDITOR OF "COMPENDIUM."

Uxmal, ŏosh-maal': a ruined city of Yucatan, 40 miles S. of Merida (see map of Mexico, ref. 7–I). The remains are the most extensive in Mexico, covering an area of several square miles; but most of them are so nearly destroyed that little beyond their ground plan is recognizable. Those in better preservation are apparently temples, standing on low truncated pyramids, and built of cyclopean masonry faced with dressed and sculptured stone. One, known as the Casa del Gobernador, is 320 feet long. Many of the sculptures are elaborate and curious, and all the work is markedly different from that of Copan and Palenque. There are no idols. Uxmal has been frequently visited by archæologists. It is said to have been occupied by the Mayas at the time of the Conquest, and even as late as 1673; but its origin is unknown. See CENTRAL AMERICAN ANTIQUITIES. H. H. S.

Uzbegs, or **Uzbecks**: a people of mixed Turkish blood inhabiting nearly all parts of Turkestan, where they are the dominant race. Intellectually and morally, they are the superiors of those about them. They are zealous Mohammedans, partly non-nomadic, and pride themselves on their culture and civilization. In 1862 the Chinese Uzbegs revolted from China, and under Yakub Beg founded a Mohammedan empire, with 1,000,000 inhabitants and 740,000 sq. miles of territory. At his death, in 1877, his empire became subject to China. Revised by M. W. HARRINGTON.

Uzziah: See AZARIAH.

V

: the twenty-second letter of the English alphabet.

Form.—V and U, which until the seventeenth century were used interchangeably as signs for both vowel *u* and consonant *v*, are merely two variant forms of the original Roman V (see under U). The Roman V had a consonant value (= *w* in *weal*), as well as a vowel value (= *u* in *rule*). Now, when Latin consonant *-u* became in Old French *v*, i. e. like *v* in Eng. *vile*, the symbol was left unchanged; hence the symbol *v* (*u*) came to have the quite distinctive values of *u* as in *rule* and *v* as in *vile*, and with these values it was adopted into Middle English orthography. The Old English had used for the sound *v* in native words the symbol *f*, which was thus forced to do double duty, both as *f* and *v*; cf. O. Eng. *findan*, find, and *ofer*, over.

Name.—The name *vee* (phonet. *vī*) is modern, being evidently constructed on the analogy of the names for *b*, *c*, *d*, *e*, *g*, *p*, *t*; similarly the modern name for *z*.

Sound.—It denotes a voiced labio-dental spirant, produced by passing voiced breath between the lower lip and the edges of the upper front teeth. Only the addition of voice distinguishes it from the sound of *f*.

Sources.—The main sources of the sound are: (1) Teutonic *v* (bilabial, i. e. *b*). All English words beginning with *v*, with the exception of *vat*, *vane*, *vixen*, are of foreign origin, mostly French. The three exceptions are loan-words from a southern English dialect, in which O. Eng. *f* became *v*; *vat* < O. Eng. *fæt*: Germ. *fass*; *vane* < O. Eng. *fana*: Germ. *fahne*; *vixen* < O. Eng. *fyxen*: Germ. *füchsin*. Teutonic *v* (*b*) was represented in O. Eng. by *f*, being thus indistinguishable from Teuton. *f*. Teutonic *v* (*b*) has the following main sources: (*a*) Indo-Eur. *bh*; cf. Eng. *weave* < O. Eng. *wefan*, Gr. ὑφαίνω; *calves*, plur. of *calf* < O. Eng. *cealf*: Germ. *kalb*, Sanskr. *gárbha-*, offspring; *love* < O. Eng. *lufu*: Germ. *liebe*, Sanskr. *lubh-*, Lat. *lubet*. (*b*) Indo-Eur. *p* between voiced sounds and not preceded by accent; Eng. *over* < O. Eng. *ofer*: Germ. *über*, Sanskr. *upári*, Gr. ὑπέρ. (*c*) Indo-Eur. *q*; *five* < O. Eng. *fīf*: Germ. *fünf*: Goth. *fimf* < Indo-Eur. *pénqe* > Gr. πέντε, Sanskr. *páñca*; *wolves*, plur. of *wolf* < O. Eng. *wulf*: Goth. *wulfs*, Gr. λύκος, Sanskr. *vṛka-*.

(2) In loan-words from early French; cf. *vain*, Fr. *vain* < Lat. *vanus*; *veal*, O. Fr. *veël* < Lat. *vitellus*; *verb*, Fr. *verbe* < Lat. *verbum*; *vine*, Fr. *vigne* < Lat. *vinea*; Eng. *wine* came into O. Eng. direct from Latin before Latin *v* (*w*) changed from *w* to *v*; *poverty*, O. Fr. *poverte* < Lat. *paupertas*; *receive*, Fr. *recevoir* < Lat. *recipere*.

(3) In later loan-words from various sources, as Lat. *veto*, *vertex*, *villa*; Fr. *vignette*, *vis-à-vis*; Ital. *volcano*, *velvet*; Russian *versl*; Scandin. *viking*, *valhalla*; Arab. *vizier*; Sanskr. *veda*, etc.

Symbolism.—V = vanadium (chem.), verb, vocative; v. = 5; Va. = Virginia; v. a. = active verb; v. i. = intransitive verb; vid. = see (Lat. *vide*); viz. = namely (Lat. *videlicet*); V. R. = Queen Victoria (*Victoria Regina*); vs. = against (*versus*); Vt. = Vermont. See ABBREVIATIONS.

BENJ. IDE WHEELER.

Vaca, ALVAR NUÑEZ CABEZA, de: explorer; b. in Estremadura, Spain, in 1507; went to Florida in 1527 in the expedition of Pánfilo de Narvaez, and after an unsuccessful land journey, again took ship, sailed along the northern coast of the Gulf, and was cast ashore at Matagorda Bay. After six years of captivity among the Indians, he met three other survivors of the expedition, with whom he journeyed westward, and followed the course of a large river, probably the Rio Grande, until he fell in with some Spanish explorers on the river Petatlan and was conducted to a town in Sinaloa. Authorities disagree as to the route taken by the four travelers, some holding that it lay through New Mexico, others tracing it through Southern Texas, Chihuahua, and Sonora. Some identify a large stream crossed by de Vaca on his westward journey with the Mississippi, and give the credit of its discovery to him instead of de Soto. The kingdom of Cibola, the country of the civilized Pueblos, is thought to have been first visited by de Vaca and his men. A joint report of their travels, given by them on arriving at Santo Domingo, is contained in Oviedo's *Historia general y natural de Indias*. De Vaca returned to Spain in 1537, but was soon afterward appointed administrator of La Plata and went to Paraguay, of which country he was the first explorer. Arrested in 1544 on the charge of one of his subordinates, he was sent to Spain and condemned to exile in Africa. He was pardoned after eight years, and lived at Seville till his death, which occurred in 1564. De Vaca published an account of his adventures in 1542. It was reprinted at Valladolid in 1555, and in Barcia's collection of narratives in 1749 under the title of *Naufragios de Alvar Nuñez de Vaca*. An English version is given by Purchas in his *Pilgrims*. See also a literal translation by Buckingham Smith (Washington, 1857 and 1871).

Vaca de Castro, CRISTOVAL: administrator; b. in Leon, Spain, in 1492. He was a lawyer and a judge of the audience of Valladolid; in 1540 he was sent to Peru to inquire into alleged abuses there, and with authority to act as governor in case of Pizarro's death. Crossing the Isthmus of Panama he narrowly escaped shipwreck in the Pacific, and finally disembarked on the coast of New Granada, purposing to proceed by land. At Popayan (July, 1541) he learned of the assassination of Pizarro and the rebellion of Almagro "the Youth." He at once assumed command, was joined by Benalcazar and others, marched through Quito to Lima, and on Sept. 16, 1542, defeated Almagro, who was captured and executed. He remained at the head of affairs until the arrival, in May, 1544, of Viceroy Vela. The latter, suspecting him of conspiracy, imprisoned him on a vessel in Callao harbor. He prevailed on the captain to sail to Panama, whence he went to Spain. There he was again imprisoned, and was only exonerated after eleven years. D. in 1562.

Vacation Schools: See the Appendix.

Va'caville: town and village; Solano co., Cal.; on the South Pac. Co.'s railway; 30 miles S. W. of Sacramento, 60 miles N. E. of San Francisco (for location, see map of California, ref. 6-C). It is in an agricultural and fruit-growing region, is the seat of the California Normal and Scientific School, and has a State bank with capital of $100,000, and a weekly newspaper. Pop. (1890) town, 2,712; village, 725; (1900) town, 4,160; village, 1,220.

Vaccination [deriv. of *vaccine*, from Lat. *vaccī'nus*, of a cow, deriv. of *vac'ca*, cow]: (1) in a narrow sense, the inoculation of an individual with the virus of cowpox, thus conferring protection against smallpox; (2) in a broader sense, the inoculation of an individual with any mild virus calculated to produce protection against malignant disease. The former use of the term is the common one, and this article treats only of the vaccination designed to prevent smallpox. It was observed that on the udders of cows an eruption was frequently seen which infected the hands of the milkers. Pustules were produced on the hands, and sometimes changed into painful sores; other parts of the body became affected, and sometimes there was extensive disturbance of the general system. The remarkable fact was discovered that persons who had passed through this disease were protected from the pure smallpox. In Scotland, England, and Holstein in the eighteenth century inoculations were made by certain persons among the laity with the contents of the pustules from the udders of cows. In the year 1781 a milkmaid who had the cowpox went to London and there in the inoculation hospital attempts were made to inoculate her with smallpox, but without success. In the medical circles of the metropolis this did not excite much attention, and it remained for a country physician, EDWARD JENNER (*q. v.*), to see its general scientific importance and to make it useful to mankind.

Jenner's Experiments.—Jenner inoculated people who had gone through with the cowpox with the virus of smallpox, and in all cases without result. Many of the persons inoculated had had the cowpox many years before, one of them fifty-

three years before, and from this Jenner concluded, although improperly, that this protection against smallpox lasted for a lifetime. On May 14, 1796, Jenner made his first vaccination. He vaccinated an eight-year-old child on the arm by making two superficial incisions, in which he placed the contents of a pustule of cowpox which had developed on the hand of a milkmaid. After this healed on the arm of the boy, he inoculated him in numerous places on the body with the contents of smallpox pustules, but without success. In this way he proved that when the cowpox was conveyed to man by inoculation it carried with it protective material. He wrote a treatise on his experiments and the results he had obtained, and sent it to the Royal College of Physicians in London to make the facts generally known, but the manuscript was returned to him with a letter by no means flattering. In 1798 he inoculated a boy with the contents of the pustule of a cow, and by successive inoculations from the boy he propagated the virus through four generations, thus showing that the virus of the cowpox did not lose its efficiency when carried through different individuals. Jenner afterward settled in London, where he published a treatise, giving the results of his experiments, which has become world renowned; it excited the greatest attention, and his experiments were repeated on a large scale. In the year 1801 10,000 persons were vaccinated by him and other physicians in England, and on more than half of them experiments were tried which proved that the method was entirely successful as a preventive of smallpox.

Utility of Vaccination.—In 1857 the British Parliament received answers from 542 physicians to questions which were asked them in reference to the utility of vaccination, and only two of these spoke against it. Nothing proves this utility more clearly than the statistics obtained. Especially instructive are those which Flinzer compiled respecting the epidemic in Chemnitz which prevailed in 1870–71. At this time in the town there were 64,255 inhabitants, of whom 53,891, or 83·87 per cent., were vaccinated, 5,712, or 8·89 per cent., were unvaccinated, and 4,652, or 7·24 per cent., had had the smallpox before. Of those vaccinated 953, or 1·77 per cent., became affected with smallpox, and of the uninoculated 2,643, or 46·3 per cent., had the disease. In the vaccinated the mortality from the disease was 0·73 per cent., and in the unprotected it was 9·16 per cent. In general, the danger of infection is six times as great, and the mortality 68 times as great, in the unvaccinated as in the vaccinated. Statistics derived from the civil population are in general not so instructive as those derived from armies, where vaccination is usually more carefully performed and where statistics can be more accurately collected. During the Franco-German war (1870–71) there was in France a widespread epidemic of smallpox, but the German army lost during the campaign only 450 cases, or 58 men to the 100,000; in the French army, however, where vaccination was not carefully carried out, the number of deaths from smallpox was 23,400. It is known that the first idea of Jenner in regard to the duration of the protection conferred by vaccination was an erroneous one. It is positive that there is a certain degree of protection which lasts during the entire life of the individual, and which in many cases is absolute, but in other cases the protection gradually declines from the date of vaccination, and in general we can say that the period of protection lasts about ten years. The best results are always obtained by repeating the vaccination every ten years from the first time. When the disease appears after vaccination, it runs a relatively limited course, similar to that of varioloid or modified smallpox. The numerous mortality-rates which have been collected show that the mortality due to smallpox depends greatly upon the number and the clearness of the scars left by vaccination. In the Stockwell smallpox hospital in London, of 703 cases without vaccination scars 47½ per cent. died; of 516 with an imperfect scar 25 per cent. died; of 632 with a good scar $5\frac{3}{10}$ per cent. died; of 677 with two good scars $4\frac{1}{10}$ per cent. died; of 301 with three good scars $2\frac{3}{10}$ per cent. died; of 249 with four or more good scars $1\frac{1}{10}$ per cent. died. From the statistics of Marson, which cover 6,000 cases, the mortality among those with the scars of several vaccinations was only 0·55 per cent.

Action of the Virus Described.—The susceptibility of an unvaccinated individual to the vaccine virus is almost an absolute one; there is usually a slight primary reaction in the place vaccinated which lasts until the end of the second day. On the third day a little nodule develops, and on the fifth day this begins to change into a small vesicle which gradually enlarges. On the seventh day this vesicle reaches the limit of its development: it is then surrounded by a reddened edge, and is of a pearly color with a central yellowish or brownish depression marking the place of vaccination. Sections made through the vesicle show a fan-like structure when examined through the microscope. There are numerous radiating branches going from the skin to the surface of the vesicle, which holds a fluid called lymph in its meshes. This is a clear, slightly yellowish opalescent fluid; a microscopic examination shows that it contains red and white blood corpuscles, small masses of fibrin, refractive globules, and usually some micro-organisms. On the eighth day the contents of the vesicle somewhat change. The vesicle opens and the lymph has a purulent character. By and by the brown spot which appeared in the middle of the vesicle extends over the entire surface, and the vesicle becomes changed into a brown crust with a central depression. After three or four weeks the crust falls off and a scar appears in its place. In the beginning this is red and superficial; it becomes deeper in the course of time, and whiter than the surrounding skin. The base of the scar often has a reticular appearance. The depressions in the scar take the place of hair follicles which have been destroyed. Along with this local affection there is more or less general affection of the body; there is considerable irritation and itching of the spot; the neighboring lymph glands are often enlarged, and there is a slight rise in the temperature of the body. There are some disadvantages connected with vaccination, but these are not necessarily dependent upon it, and are the result of its performance by inexperienced or careless persons. There is sometimes an extensive gangrenous inflammation extending from the spot of vaccination; in other cases there may be severe inflammation of the glands in the axilla, with suppuration, or in other cases an erysipelas extending from the spot of vaccination to neighboring parts. Of especial importance are the very few cases in which syphilis has been conveyed by vaccination. There have been collected in the whole history of smallpox records of fifty such cases with about 700 cases of retransference of the disease. When this number is divided among the millions vaccinated, it is easily seen that the danger must be a very slight one. All of these disadvantages connected with vaccination can be easily avoided. In the first place the danger of syphilis is always avoided by using the animal virus, and in general at the present time in civilized lands this is the only virus which is used. The other infections, the extensive inflammations, etc., are due to inoculation with various micro-organisms at the time when the vaccination is performed. For this the person performing the vaccination is frequently directly culpable by using dirty instruments.

Method of Vaccinating.—The method ordinarily used in procuring the lymph is to inoculate young heifers with the virus of cowpox. The place selected for the inoculation is on the mamma; when the vesicles are fully formed and before the stage of pustule formation is reached incisions are made in the vesicles and small ivory points are dipped into the fluid, or it may be drawn up in capillary tubes. When ivory points are used the lymph on them is allowed to dry, and they may then be kept for an almost indefinite time. In performing the operation the skin on the spot selected, which is usually the shoulder or upper part of the arm, should be carefully cleansed, and then with a perfectly clean instrument the epidermis should be gently scraped off over a small space, which need not be larger than an eighth of an inch square. As soon as the moist deeper layers of the skin are reached the ivory point containing the virus should be rubbed over the spot, and the small wound allowed to dry.

Notwithstanding the evidence from all sides as to the efficacy of vaccination as a protection from smallpox, there have not been wanting opponents to the procedure. It is impossible for any one with any acquaintance at all with the nature of the evidence, and with any appreciation of the value of evidence generally, to see on what grounds the position of these enemies to society is based. See the article IMMUNITY in regard to the way in which immunity by vaccination and inoculation is produced. W. T. COUNCILMAN.

Vaccin'ium: a genus of plants to which the WHORTLEBERRY (*q. v.*) belongs.

Vac'uum [= Lat., liter., neut. of *va'cuus*, empty, void]: a void; a portion of space which contains no matter. The definition implies a condition which it is impracticable to fulfill altogether, but the physicist is able to approach almost indefinitely near to the fulfillment. The ordinary mechanical

air-pumps cease working before the pressure is reduced to $\frac{1}{1000}$ of an atmosphere, but by means of mercury vacuum pumps of the type designed by Sprengel it is possible, as is explained in the article PNEUMATICS (*q. v.*), to obtain an exhaustion of $\frac{1}{1000000}$. In the same article is an account of the method of measuring such high vacua. By the addition of chemical and other processes for getting rid of the traces of vapor which remain, even after the action of the mercury-pump has reached its limit, it is possible to attain to still higher degrees of exhaustion. Thus Crookes, Rood, Bidwell, and others describe vacua of from $\frac{1}{10000000}$ to $\frac{1}{200000000}$ of an atmosphere. The properties of gases at such low pressures are of great interest. A high vacuum is, for example, the best of insulators againt the passage of heat. Dewar made use of this property in preparing a vial of liquid oxygen for transportation. The liquid, which boils at —196° C., was placed in a double flask. The inner vial was coated with a mirroring surface of mercury (frozen) to protect the contents from radiation. Between the walls of the inner and outer flasks the pressure was reduced to a very small quantity. In this manner, without further shield against heat conduction, the oxygen was carried with but little loss from London to Oxford, a distance of 63 miles. The phenomena which occur when an electric discharge takes place through an exhausted receiver afford further illustrations of the importance of the study of partial vacua. A difference of electrical potential which is capable of sending sparks through only a few millimeters of air at ordinary pressure will cause a discharge through many centimeters when the pressure is reduced to a few thousandths of an atmosphere. The form of the discharge varies in the most striking and beautiful manner as the degree of exhaustion increases. (See ELECTRIC DISCHARGE, ELECTRICITY, and GEISSLER'S TUBES.) At a pressure somewhat less than $\frac{1}{25000}$ atmosphere the discharge through the vacuum changes its form altogether, and a series of remarkable effects follow which have been studied by Crookes. The electrical discharge at these low pressures develops luminescence of the solids in its path, varying with the nature of the material. The phenomenon is known as the Crookes effect. Finally, at the very highest attenuations the discharge *in vacuo* ceases altogether. These partial and approximative vacua of the physicist never entirely meet the definition of that complete void the possibility of the existence of which used to form a subject of debate among the earlier philosophers. By virtue of the varied phenomena which they present, however, they are of much greater importance, from all standpoints excepting that of the metaphysician.

E. L. NICHOLS.

Vaga, PERINO, del: painter; b. in Florence, June 28, 1500. His family name was Buonaccorsi. He was adopted by an artist called Andrea dei Ceri, who took him from a druggist whom he served as assistant. Recognizing the boy's great gifts, he placed him with Ghirlandajo, whose best pupil he soon became. He was afterward taken to Rome by a mediocre painter called Vaga, who engaged him to help him in his work. In Rome he studied ancient art, became one of the best draughtsman of his day, and was chosen by Raphael to execute, together with Giovanni da Udine and Giulio Romano, his designs for the stucco and arabesque decorations of the loggias of the Vatican. He was also commissioned to decorate the great hall of the Appartamenti Borgia and the house of the archbishops of Cyprus, and executed other works, till he was driven from the city by the plague. He took refuge in Florence, where the Carthusians commissioned him to execute an important work for them which he designed, but was unable to carry out on account of the plague that broke out in Florence. In 1525 Perino was in Rome and married Catharine, the sister of Giovanni Francesco Fattore, a brother artist. It was at that time he painted *The Birth of Eve* in the Church of San Marcello. The sacking of Rome obliged him again to wander with his wife and child. After trouble and imprisonment he arrived in Genoa, where Prince Doria became his patron, and employed him to decorate his palace beyond the gate of St. Thomas. On his return to Rome he restored many of Raphael's works and received innumerable orders, but much of his later work is inferior, owing to many commissions which led him to employ incompetent assistants. The Sala Reale in the Vatican, begun under Paul III., from whom he received a regular salary, is his greatest work. He died in Rome, Oct. 14, 1547, worn out by overwork and dissipation.

W. J. S.

Vagan'tes, Vagi Schola'res, or **Go'liards**: wandering clerks of the Middle Ages. The class was a large one and contained persons of the most diverse characters—students roaming from university to university, clergy willingly or unwillingly unprovided with benefices, and even mere buffoons and popular entertainers who had happened to obtain something of Latinity at some monastic or cathedral school, and who used their uncertain connection with the Church as a means to keep them out of the hands of the secular authorities. At a very early period the obvious opportunities for abuse in such a wandering and unattached life brought upon the Vagantes the denunciations of the councils of the Church. Like the modern tramp, who is in a sense their degenerate descendant, they became the terror of the communities into which they came. The lawlessness of their lives, too often unpunished, owing to their ready assertion of their right of clergy, brought discredit upon the whole body of the latter. They seem to have grown particularly prevalent during the twelfth and thirteenth centuries, the period when the great European universities were coming into being. France and England were the countries in which they most flourished; but they were to be found in great numbers also in Germany, Italy, Spain, and even Bohemia. At last the Church became thoroughly aroused, and by severe measures cut off from itself all those among the Vagantes who refused to regulate their lives. With the end of the thirteenth century they ceased to exist as a distinct clerical class.

The most interesting and important matter connected with the Vagantes, or Goliards, is the Latin poetry produced by them. Of this a considerable amount has come down to us. Though written by clerks, it is thoroughly profane in its character for the most part, and contrasts strangely with the hymns and other poetry of the Church. They seem to have studied Latinity only that they might use the amorous ideas and mythology of the Roman poets. They imitated, too, though in Latin, the verses of their contemporaries, the troubadours and trouveres. Often their praises of wine, women, and song reached an almost inconceivable cynicism. They did not limit themselves, however, to these subjects. They were violent haters, as well as too ardent lovers; and many of their poems are devoted to denunciations of their enemies, the monks and the professedly well-regulated clergy, whose vices they castigated unsparingly.

A curious development of the activity of the Vagantes was the institution among them of a kind of mock order, after the manner of the orders of monks. They chose as their patron saint Goliath, probably because of the similarity of his name to *Goliardi* (a derivative, perhaps, of the French *gaillard*, gay, merry). They had mock rites and ceremonies, all parodies of those of the Church. They had a kind of pope, known as *primas vagorum*, or *Archipoeta*, or simply *Golias*. They had forms of initiation into the order. In short, they made their ribald lives the parody of the lives of the regular clergy. And so it came to pass that the very word *goliardeis* meant, as in Chaucer (*Prol.*, v. 560), a loose and ribald fellow.

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A. R. MARSH.

L. of C.

Vagrants and Vagrancy: terms which, in their most general sense, mean "wanderers" and "wandering"; but as used in legal works and statutes they have come to designate various classes of disorderly persons who can not be brought within any definite classification. They can be properly indicated only by giving in effect the statutes which treat of them. In all civilized countries there is more or less regulation of vagrancy by law according as the conditions giving rise to the necessity for such regulation exist or are absent. For this same reason the laws of each country must be adapted to the suppression of that species of vagrancy which is found to be most detrimental to the public welfare, so that no general classification of the laws upon this subject can be given. Thus in the U. S. the laws regulating the subject vary widely both as to the kind of vagrancy intended to be suppressed and as to the severity of punishment inflicted upon vagrants. In the U. S. the term "tramp" is in general use as equivalent to vagrant in its general sense of a wandering disorderly person, or one wandering about without any visible means of support; but vagrant in its wider sense is applied to many classes of persons who would not be termed tramps. In England vagrancy has been a subject of regulation by law for many centuries, and the laws there in force now apply (by extending acts) to Scotland as well as Ireland and Wales. Owing to the gradual development of these laws and the varied conditions to which they are intended to apply, their history and present state will serve as a good illustration of the general treatment of the subject by the laws of other countries. Generally speaking, the class of mendicant vagrants is more freely tolerated in European countries than in the U. S.

Outline of English Vagrancy Laws.—The first vagrancy laws of England grew out of an attempt to regulate labor by requiring laborers to continue to reside in a given place, and labor there for the wages ordinarily given. In 1349 and 1350 when the institution of serfdom was breaking down and a rise in laborers' wages was taking place consequent to the pestilence of the black death, the Statutes of Labourers (two in number) were passed, for the purpose of checking this rise in wages, and, as has been suggested, to provide a kind of substitute for serfdom. These statutes not only regulated the wages of laborers and mechanics, but confined them to their existing places of residence, compelling them to work for any one who should request convenient service of them, and to take only the customary rate of wages, and fixing the wages of the most important classes of mechanics. These statutes were for 200 years confirmed, amended, and extended or modified on several occasions. The rigorous execution of their provisions was insured by giving wide authority on all the matters dealt with to the county and borough justices and police magistrates. Vagrancy, or wandering, then became a crime, since if a man of this class went out of his own hundred or specified territory, even to look for work, he became a vagrant and a criminal. Many statutes were passed in the time of Richard II. referring to the number of persons who wandered about the country and committed all sorts of crimes, leaving their masters and associating in bands to overawe the authorities. The last of these statutes provided that "it is ordained and assented to restrain the malice of divers people, feitors, and wandering from place to place, running in the country more abundantly than they were wont in times passed, that from henceforth the justices of assizes in their sessions, the justices of peace, and the sheriffs in every county shall have power to inquire of all vagabonds and feitors and their offenses and upon them do all the law demandeth."

In 1388 an elaborate statute was passed (12 Rich. II.) containing many provisions as to laborers' wages and justices, and providing that no servant should leave the hundred in which he dwelt without a letter patent from the king, stating the cause of his going and the time of his return, and anyone found wandering without such a letter was to be put in the stocks and kept till he found surety to return to his service. In another chapter a distinction is made between beggars "able to labor" and "beggars impotent to serve," and this act is the first to recognize a distinction between the impotent and the able-bodied poor.

In the reign of Henry V. a remarkable act was passed which states that "the servants and laborers of the shires of the realm do flee from county to county, because they would not be justified by the ordinances and statutes by the law for them made, to the great damage of the gentlemen and others to whom they should serve because that the said ordinances and statutes for them ordained be not executed in every shire." It empowered justices of the peace to "send their writs for such fugitive laborers to every sheriff in the realm of England" who were to take them and send them back to the place whence they came, and it also gave justices of the peace "power to examine as well all manner of laborers and servants, and their masters as artificers," and punish them upon their confession.

The next important act relative to this subject was that of 22 Henry VIII., c. 12, passed in 1530. It imposed very severe penalties on vagrants. The impotent poor were to be licensed to beg within certain limits, and begging without a license was punishable by whipping. Vagrants able to labor were to be stripped naked, tied to a cart's tail, and whipped through the town till bloody, and then sent back to labor, being liable to more whipping if they failed to go directly home. People pretending to knowledge in "palmistry or other crafty science," and some others of a like character, were to be whipped two days together for the first offense, and for the second to be scourged two days, be put upon the pillory the third day from 9 till 11 A. M., and to have an ear cut off, and for the third offense the same penalty, the other ear being cut off. Various other provisions were also contained in the statute providing for the punishment by whipping or mutilation of other classes of vagrants.

In 1547 all these statutes were repealed, as not being sufficiently severe, by 1 Edw. VI., c. 2, which provided for the arrest as vagabonds of loitering and idle wanderers, or those who ran away from their work. As punishment they were to be branded with a V, and given as slaves for two years to any one demanding them, and they were to be fed on bread and water and refuse meat, and each was to be caused to work in such labor "how vile soever it be as he shall be put unto by beating, chaining, or otherwise." If he ran away he was to be branded with the letter S, and adjudged a slave for life, and upon running away again he was to be hanged. Two years later, in 1549, this barbarous act was repealed and the acts of Henry VIII. were revived, and in 1552 these latter were confirmed, but licenses to beg were permitted to be given.

In 1572 all these statutes were repealed by an act which provided that all beggars should be "grievously whipped, and burnt through the gristle of the right ear" for a first offense, and be guilty of a felony for a second. In 1597 was passed the famous statute 39 Eliz., c. 4, which remained in force, with some changes, for over a century. It provided for the erection of houses of correction for the reception of rogues, vagabonds, and sturdy beggars till either put to work or banished; and ordained that any such persons found begging, wandering, or misordering themselves should be stripped naked to the waist and whipped in public till bloody, and then sent to their birthplace by a fixed route (being whipped upon every deviation from it), to be taken to the house of correction, and there kept till employed or banished.

This act defines rogues and vagabonds not by any general characteristic, but by an enumeration of a large number of classes—persons either disturbing the good order of the community or considered detrimental to society. "All persons calling themselves scholars going about begging; all seafaring men pretending losses of their ships and goods on the sea; all idle persons going about either begging or using any subtle craft, or unlawful games and plays, or feigning to have knowledge in physiognomy, palmistry, or other like crafty science, or pretending that they can tell destinies, fortunes, or such other fantastical imaginations; all fencers, bear-wards, common players, and minstrels; all jugglers, tinkers, and petty chapmen; all wandering persons and common laborers, able in body and refusing to work for the wages commonly given; all persons delivered out of gaols that beg for their fees or travel begging; all persons that wander abroad begging, pretending losses by fire or otherwise; and all persons pretending themselves to be Egyptians (i. e. gypsies)" were included in the list.

Various minor amendments and additions to this act were made up to 1713, when all laws relating to rogues and vagabonds were repealed, and the act of 1597 re-enacted with a few omissions.

In 1744, after various repealing and amending acts, a comprehensive act was passed, which is largely the basis of all subsequent legislation in Great Britain on this subject. It distinguished three classes of offenders—(1) idle and disorderly persons, (2) rogues and vagabonds, and (3) incorrigi-

ble rogues, and made minute provisions as to their arrest, return to their place of settlement, and punishment.

The act (5 Geo. IV., c. 83) which is still in force was passed in 1824, after the act of 1744 had been amended (1792) and repealed (1822). The act of 1824 (amended and made applicable to Scotland by 34 and 35 Vict., c. 112, section 15) repealed all prior acts and greatly enlarged the list of persons classed as rogues and vagabonds, including with subsequent amendments under those terms almost all persons who prowl about apparently with an unlawful purpose. This act provides for the punishment as vagrants of (1) idle and disorderly persons, (2) rogues and vagabonds, (3) incorrigible rogues, and provides that the first class shall be imprisoned with hard labor for any term not exceeding one month, the second class for any term not exceeding three months, and the third class till the next general or quarter sessions of the peace, when the offender may be further imprisoned with hard labor for a year, and if a male may be whipped.

In the U. S. vagrants were so comparatively few in numbers, and so generally harmless in character, that prior to the civil war the subject of the regulation of vagrancy received but little public attention. Subsequently, however, owing partly to the effects of the disbandment of the armies and the scattering of the numerous camp-followers through the country, partly to the hard times of 1873 and later, and partly to the various changes of condition accompanying and resulting from the growth of the country and the increase of population and of the numbers of immigrants, vagrants, and especially those of the class commonly designated as tramps, increased so largely in numbers, and became so much more vicious and dangerous in character, that many rural homes became unsafe for women and children, and cases of violence and crime became not uncommon along their routes of travel—which are fairly well fixed—even in villages of considerable size. The evil became so great as to attract much public attention, and resulted in the enactment generally in the U. S. of vagrancy laws much more stringent and comprehensive than those which had previously existed, the larger part of them dating subsequent to the year 1878. Nearly all the States followed to a large extent the English system of vagrancy laws, with local variations made for the sake of greater efficiency or to meet the requirements of local conditions. The States most troubled by tramps and wandering vagrants generally were those through which the great railway lines extended. The State of New Jersey passed very stringent repressive laws, as well as Pennsylvania. The latter, which was one of the first to attempt the suppression of the tramp evil, furnished the groundwork for the laws of many other States, so far as they differ from those of England.

The General Vagrancy Act of Pennsylvania was passed in 1876, and included under the title of vagrancy a large number of wandering and disorderly persons, being more general in its terms than the English vagrancy statutes; but in 1879 an act was passed distinguishing a *tramp* from a *vagrant*, in general, as being "any person going about from place to place begging, asking, or subsisting upon charity, and for the purpose of acquiring money or a living, and who shall have no fixed place of residence or lawful occupation in the county or city in which he shall be arrested"; and by this act such persons are made liable to imprisonment by separate and solitary confinement at labor, in the county jail or workhouse, for not more than twelve months, while vagrants in general are liable only to labor on a county farm, or upon the roads or highways, or in a house of correction, poorhouse, workhouse, or common jail, for a term of not less than thirty days and not more than six months.

The passage of severe laws in one State was followed by a migration to others less severe in their laws, and these States in turn increased the stringency of their laws until such laws became general throughout most of the U. S. One of the most effective, but much criticised, measures was that providing for the punishment of vagrants by compelling them to work in chain gangs upon the roads or in breaking stone. The constitution of the State of California provided for the public whipping of tramps, and a determined, but unsuccessful, effort was made in Wisconsin to enact a law for the whipping of tramps.

The enforcement of vagrancy laws is more or less lax in a given locality according to the social, political, and economical conditions which make vagrants more or less objectionable. The severities of the old laws of England have been largely done away with, partly because it has come to be recognized that here, as with other crimes, excessive severity is not proportionally, if at all, a greater deterrent; and partly because it is recognized, as the result of advances in economical and sociological knowledge, that vagrancy is due to social and economical conditions, the removal of which is the true remedy. F. STURGES ALLEN.

Vagus Nerve, or **Par Vagum** [Lat.; *par*, pair + *va'gum*, neut. of *va'gus*, wandering]: the more usual name for the tenth cranial nerve of vertebrates, called in human anatomy PNEUMOGASTRIC NERVE (*q. v.*). It acquires its greatest development in the aquatic vertebrates, where it supplies the frequently extensively developed lateral line system of sensory organs. J. S. K.

Vahlen, JOHANNES: classical scholar; b. at Bonn, Germany, Sept. 28, 1830; studied under Ritschl; privat docent at Bonn, 1854; professor extraordinary in Breslau, 1856; ordinary professor in Freiburg 1858, but called to Vienna in the same year. In 1874 he became Haupt's successor at Berlin. His work is chiefly devoted to Aristotle and early Latin. He edited Ennius and Nævius (1854); Lachmann's *Lucilius* (1876); Haupt's *Catullus Tibullus* and *Propertius* (4th ed. 1879); Haupt's *Horace* (5th ed. 1885); O. Jahn's Longinus's Περὶ ὕψους (2d ed. 1885); Koch's *Seneca* (1879); Cicero's *De legibus* (2d ed. 1883); Plautus's *Menæchmi* (1882); Aristotle's *Poetics* (3d ed. 1885), with a commentary, *Beiträge zu Aristoteles Poetik* (4 pts., Vienna, 1865–67), the standard works on the subject; and *Lorenzo Valla* (2d ed. 1870). Besides very numerous treatises of permanent value on Aristotle, Alcidamas, Ovid, Propertius, Ennius, etc., he is also the author of the anonymous semi-annual proœmia of the University of Berlin (since 1874), dealing with Greek and Latin texts in a way which stamps them as perfect models of critical and hermeneutical exegesis. A. G.

Vāiçeshika (vaă-i-shāsh'ĕĕ-kaă) **Philosophy**: one of the six systems of Brahmanical philosophy. These systems form three pairs, and each member of these several pairs stands in especially close relation with its mate: to wit, the MĪMĀṄSĀ with the VEDĀNTA; the SĀNKHYA with the YOGA; and the VĀIÇESHIKA with the NYĀYA PHILOSOPHY (see these articles). The last two, which teach the evolution of the world from atoms and are distinguished from the rest by a rigorous classification of the fundamental logical conceptions, are usually fused together in the philosophical literature of India and treated as one. On this account Occidental scholars for some time confused the doctrines of the Vāiçeshika with those of the Nyāya, and only recently has it become possible to determine the contents of the two systems in their original and distinct individuality. The Vāiçeshika system is undoubtedly of greater antiquity than the Nyāya, although, indeed, the opposite opinion prevailed until recently. There is good reason for referring the Brahma-sūtras or Sūtras of the VEDĀNTA (*q. v.*) to the beginning of our era or to a time slightly anterior. Since the Brahma-sūtras themselves contain (ii. 2. 12–17) a distinct polemic against the doctrines of the Vāiçeshika, we are justified in referring the origin of the Vāiçeshika system to a time prior, but not long prior, to the birth of Christ. At the close of the passage just cited we find the interesting remark that the Vāiçeshika is not really worthy of any serious consideration because nobody accepts it, a slight which, if well founded, stands in surprising contrast with the fact of the great popularity of the system in India in later times. On the other hand, the system can not be so old as to permit its derivation from the atomistic doctrines of Leucippus and DEMOCRITUS (*q. v.*), although, when we consider the other manifold correspondences between Indic and Greek philosophy, there is often a great probability of historical connection and of derivation from India.

The name of the founder of the Vāiçeshika system is said to be Kaṇāda, that is, *Kaṇa* + *ada*, or Atom-eater; and, since the Hindus have the habit of giving to the same person several appellations which are different in form but yet etymologically of identical signification, he is also called Kaṇa-bhuj and Kaṇa-bhaksha, both also meaning Atom-eater. It is likely that this was originally a mere nickname which was chosen in allusion to the character of the system, and which, after coming into general vogue, displaced the real name of the founder.

The strength of the system lies in its establishment of the six categories (*padārtha*), under which, according to Kaṇāda, everything existent can be subsumed. Nevertheless, Kaṇāda does not restrict himself to the establishment of his categories; he endeavors rather in their discussion to solve the most varied problems of existence and of thought, and there-

by to arrive at a comprehensive philosophical view of the world. The categories or predicaments are as follows: 1, Substance (*dravya*); 2, quality (*guṇa*); 3, motion or action (*karman*); 4, community or generality (*sāmānya*); 5, difference or particularity (*viçesha*); and, 6, intimate relation or inherence (*samavāya*). These notions are very precisely defined and are disposed under various subdivisions.

1. Under the category of substance are placed earth (i. e. all organic bodies, and all inorganic matter except the other elements), water, light, air, ether, time, space, soul, and the organ of thought. It seems surprising to us that the Vāiçeshika should account space and time to be substances; but we must bear in mind that in this system "substance" means nothing more than that which possesses quality or motion and which is the immediate cause of a phenomenon. The difficult question of the nature of space and time, of which Kant was the first to give the definitive solution, is treated throughout the Indic philosophies only incidentally and as a subordinate matter. The Sānkhya has gone furthest in its treatment, and declares space and time to be two qualities of the eternal primeval matter considered as a unit. The discussion of the category of substance gives Kaṇāda opportunity to develop his theory of the origination of the world from atoms (*aṇu*, *paramāṇu*, *kaṇa*). The atoms of earth, water, light, air, and ether are eternal and uncreated; and although they themselves have no extension, yet their heterogeneous nature results, when they are combined with one another, in their extension and visibility. Even an aggregate of three atoms (*try-aṇuka*), or, according to some teachers, of three double-atoms (*dvy-aṇuka*), possesses a certain extension and is visible as the mote (*trasa-reṇu*) in the sunbeam. This whole theory is stoutly contested in the Vedānta and Sānkhya works, and upon the same ground—namely, that if the single atoms have no extension, then also an aggregation thereof can have no extension, inasmuch as every attribute of a product is conditioned by a similar attribute of its material cause.

2. The category of quality embraces color, taste, smell, feel (and especially temperature), number, quantity, or extension, individuality, conjunction, disjunction, priority, posteriority, intelligence, pleasure, pain, desire, aversion, and volition. Çaṁkaramiçra, in his comment on the Vāiçeshika-sūtras, i. 1. 6, enlarges Kaṇāda's list of seventeen by the addition of seven others, which, although virtually included in the aforesaid seventeen, are yet, he opines, worthy of especial mention. These are: gravity, fluidity, viscidity, sound (the especial quality of the element ether), after-effect (*saṁskāra*), merit, and demerit. The *saṁskāra* manifests itself (*a*) as the continuance of a motion in consequence of a given impulse, (*b*) as elasticity, and (*c*) as memory. This enumeration, as is evident, contains not only qualities of matter, but also such as have to do with spirit. In this connection accordingly Kaṇāda is led to develop his psychology. In opposition to the Sānkhyans and Vedāntists, who hold that the soul is devoid of qualities, the Vāiçeshika system maintains that the spiritual qualities belong directly to the soul. The soul is without beginning and without end and all-pervasive, and is thus free from the bonds of space and time. If now the soul came immediately or directly into connection with the objects of cognition, it would follow that all objects would present themselves simultaneously to consciousness. Kaṇāda explains why this is not the case by assuming an organ of thought, the *manas* or inner sense, with which the soul stands in the closest connection. It is only through the mediation of this *manas* that the soul takes cognizance not only of external things, but also of its own qualities. The *manas* is eternal like the soul; but, in contrast with the soul, the *manas* is an atom, and as such it is capable of comprehending only a single object in any given instant. For the cognition of eternal things there is need of the co-operation of the corporeal senses with the *manas*. These senses, according to the Vāiçeshika, are not modifications of consciousness, but are material; and are formed of the five elements: the hearing consists of ether; the sight, of light; the taste, of water; the sense of feeling consists of air; and the sense of smell consists of earth.

3 and 4 and 5. The varieties of the third and fourth categories, that is (3) of motion or action and (4) of community or generality, are of small significance. The fifth category, difference or particularity, on the other hand, is of importance, inasmuch as it plays so great a part in the explanation of the origination of the world from atoms. And, accordingly, the name of the system, "Vāiçeshika," is derived from the Sanskrit word for "difference," which is *viçesha*.

6. Of especial interest is the sixth category, inherence or intimate relation. It does great credit to Kaṇāda and his acumen that he has set it up. This notion is sharply distinguished from that of connection (*saṁyoga*), which is occasional or accidental, and not indissoluble, and which appears as one of the varieties of the category of quality. Inherence is the relation which exists, for example, between a thing and its qualities, between a whole and its parts, between every object and the general idea which is connected with it, between motion and the thing which is moving, between the species and the genus. It is remarkable that this important notion has found no acceptance among the adherents of the other systems in India excepting those of the Nyāya.

7. Later teachers of the Vāiçeshika system have added to the six categories a seventh, to wit, non-existence or negation (*abhāva*), which has exercised a portentous influence upon the development of logical investigation. This category too is divided, with genuine Indic subtilety, into the four varieties of prior, posterior, conditioned, and absolute non-existence. Prior non-existence is what we should call in positive terms "future existence." For posterior non-existence we should say "past existence." Conditioned or reciprocal non-existence is the relation subsisting between two non-identical things (e. g. a jar is not cloth). Absolute non-existence is usually exemplified by the impossibility of fire in water.

The ultimate purpose of the Vāiçeshika philosophy, like that of other Brahmanical systems, is the release of the souls from the distressing round of existences; and as the one and only means of attaining such release, the system recognizes the right knowledge of all that is knowable, which knowledge it is the aim of the system to teach. The Vāiçeshika-sūtras constitute the principal treatise of this school; and they have been edited, with the commentary of Çaṁkaramiçra, and with another commentary written by the editor himself, by Jayanārāyaṇa Tarkapañcānana, in the *Bibliotheca Indica* (Calcutta, 1861). The Sūtras were translated into German, with comments, by Eduard Röer, in the *Zeitschrift der deutschen morgenländischen Gesellschaft*, xxi. and xxii.; and into English, with copious extracts from the commentators, by A. E. Gough (Benares, 1873).

RICHARD GARBE. Translated by C. R. LANMAN.

Vail, THOMAS HUBBARD, S. T. D., LL. D.: bishop; b. at Richmond, Va., of New England parents, Oct. 21, 1812. He graduated at Washington (now Trinity) College in 1831, and at the General Theological Seminary in 1835; ordained deacon in St. Mark's church, New Canaan, Conn., June 29, 1835; ordained priest in Grace church, Boston, Mass., Jan. 6, 1837. During the three months following his ordination to the diaconate he officiated in St. James's church, Philadelphia. After this he acted temporarily as assistant to Rev. J. M. Wainwright, then rector of St. Paul's church, Boston. Under Dr. Wainwright's direction he went to Worcester, Mass., and organized All Saints' church. In 1837 he became the rector of Christ's church, Cambridge; in 1839 of St. John's church, Essex, Conn.; and in 1844 of Christ church, Westerly, R. I., where he remained fourteen years, during which time he was a deputy to the General Convention from the diocese of Rhode Island, and also a member of the standing committee. In Dec., 1857, he returned to Massachusetts, and became the rector of St. Thomas's church, Taunton; and in 1863 he became the rector of Trinity church, Muscatine, Ia. He was consecrated first Bishop of Kansas in Trinity church, Muscatine, Ia., Dec. 15, 1864. He published an edition of Rev. Augustus F. Lyte's *Buds of Spring*, with memoir and additional poems of his own (Boston, 1838), and wrote *Plan and Outline, with selections of books, under many heads, of a Public Library in Rhode Island* (1838); *Hannah, a Sacred Drama* (Boston, 1839); and *The Comprehensive Church* (1841; 3d ed. 1883). He also delivered and published a number of occasional sermons, and a volume of his charges and episcopal addresses has been published since his death. He was president and founder of Bethany College, Topeka, Kan. The twentieth anniversary of his episcopate was celebrated at Topeka in 1885. D. at Bryn Mawr, Pa., Oct. 6, 1889. Revised by W. S. PERRY.

Vail, WILLIAM BERRIAN: member of Canadian Privy Council; b. in Sussex Vale, New Brunswick, Dec. 20, 1823, and educated there. He represented Digby in the Nova Scotia Assembly in 1867–74, and during that period was a member of the executive council and provincial secretary, and sat for the same county in the Canadian Parliament in

1874–78 and 1882–87. He became a member of the Privy Council, and was appointed Minister of Militia and Defense Sept. 30, 1874, and retained this portfolio until 1878, when he retired with the Mackenzie administration. N. M.

Vaillant, Le: See LEVAILLANT, FRANÇOIS.

Vaish'navas [from Sanskr. *Vāiṣṇava-*, liter., masc. adj. of or pertaining to Vishnu, deriv. of *Viṣṇu-*, Vishnu]: a Hindu sect whose peculiar patron and most especial object of veneration is Vishnu, the second person of the Indian Trimūrti. The sect is itself subdivided into almost innumerable smaller sects, all of which are bound together by the one idea—that, above all other gods of the Hindu pantheon, Vishnu stands supreme. Roughly speaking, these sects of Vaishnavas may be classed as the "Northerners" and the "Southerners," according to the *ipsissima verba* of Hindu theology. But the tone of Vaishnava opinions is constantly changing, and we find the so-called Northerners constantly contending nowadays, in the Deccan and extreme south of India, with the Southerners. So, in reality, no hard and fast line can be drawn, and no grouping of the hundreds of sects comprising the Vaishnava sect can be satisfactorily made. The term *Vaishnava* is as elastic as that of Christian. Even the mark on the Vaishnava's forehead, which is shaped like a trident, can not invariably be depended upon. One sect prolongs the central prong, so to speak, of the trident to the tip of the nose, and holds that it is necessary to salvation that this should be done. The opposing sect stops short at the eyebrows. Many a bloody feud between Vaishnavas has arisen on account of this one controversy. Then some of the sectarian marks differ in the thickness of the lines; and even that, in the watchful eye of a scrupulous Hindu, is of immense importance. So are also the necklaces and rosaries, the forms of the garments worn, and, above all, the sacred initiatory formulas.

The distinctive mark of the Northerners is formed by two white perpendicular streaks, or two streaks converging like the lines of a V from the roots of the hair, across the forehead, to the eyebrows. These streaks are of powdered sandal-wood made into an adhesive paste. From between the eyebrows another white streak is drawn, connecting the lower portion of the V to the tip of the nose, thus making the mark resemble a Y. Some of these sectaries make the line along the nose stop at the middle of its ridge. The distinctive mark of the Southerners consists of two white lines of chalk, perpendicular and parallel, from the roots of the hair to the eyebrows, with a streak of similar color joining the base of the lines, and running at right angles to them above the nose. In the middle, between the two perpendicular white lines, is drawn, parallel with them, a line of red paste composed of turmeric and lime, or simple red chalk.

The Northern Vaishnavas number more than 45,000,000. Two out of three Vaishnavas in Bengal are of this sect. They believe that faith in Vishnu will save more swiftly, surely, and effectually than works can. The virtues of pious meditation and abstraction are not to be compared to the virtues of belief. Knowledge is of little account; faith is all in all. It is good to subjugate the passions, to practice the *yoga*, to give alms, to be of a mind filled with charity, to call on the sacred name, to wear the sacred symbols on the person, to be honorable, virtuous, and meek; but faith is the sole and supreme fount of salvation. And yet these mild Hindus, who worship the Preserver, and believe that by belief alone in the nine-times-incarnate-One they shall attain heaven, tell their brethren of the Rāmānūja sect that the latter can not be saved unless they lengthen the middle stroke on their foreheads to the tip of their noses! The Rāmānūjas naturally reply that the performance of this lengthening of the line as a requisite for salvation is in itself a "work," so that the Northerners are inconsistent with regard to their avowed creed. In older days these theological disputes used to lead to exhibitions of physical force. Temples used to be hurled down, cities depopulated, women and innocent children butchered—all to prove whether the distinctive central mark of a Vaishnava's forehead should stop at his eyebrows or whether it should elongate itself to the root of his nose!

But, after all, the Northerners must be considered the most liberal. They are the Protestants of Vaishnava theology. They insist on faith as the supreme requisite. They are not so ground down by usages and multitudinous formulas as are the Rāmānūjas. The latter are more in the hands of their priests; the former own as their great high priest conscience. The Northerners adhere as much as possible to the simplest tie which can possibly bind them to the worship of Vishnu as a distinctive connecting link—that is, the repetition of the name of the god in the person of the greatest of his avatārs, Krishna! Only repeat this, and worship is complete, and all ceremonial observances are wholly needless.

The Southern Vaishnavas are especially fond of worshiping Lakshmi, the consort of Vishnu. No Vaishnava of Southern India will allow any one to look on his food while he is eating it. A look would be pollution, and he at once would treat it as ordure and bury it out of sight. He believes that Vishnu is the spring, center, foundation, cause, and creator of all. Matter and spirit unite in him as God and as the Incarnate. In Southern India the Rāmānūja Vaishnavas number many tens of millions, and their temples are among the most splendid in India.

The *Vallabha-Āchāryas* are a strong, well-organized sect of Vaishnavas of Central India. Their head priests are called *mahārājas*. The votaries of this sect are bound to reverence their teacher as God. It is said, "The priest or mahārājah is Vishnu himself; he is Krishna incarnate; the true believer must bestow on the priest his body-organs of sense, life, heart, faculties, wife, house, family, property, and all his own self."

The *Madhwā Āchārya* sect number many adherents, especially in the Telugu country. They believe in Vishnu as the great invisible First Spirit, the Prime Cause, the Originator of the Universal, the primeval Sole and Supreme, perfectly good, omnipotent, and of nature totally indescribable. This sect *brand* themselves with Vaishnava symbolic emblems as a preventive against schism. As a part of their worship they demand that virtue shall be invariably practiced, alms freely offered, truth always told, and that kindness and protection and courtesy be shown to all men, especially strangers. They deny the doctrine of absorption, and so differ in a vital point of doctrine from a large number of their co-religionists. Brahma, they believe, grew out of a lotus, which itself grew out of Vishnu's navel. Their idea of heaven is that of final liberation from future births, and sharing with Vishnu in every respect the glories and felicities of his heaven. The true believer, after ascending thither, will not only be perfectly happy, but will be endued with omnipotence. The sacred color of this sect is a deep saffron. Their supreme authority is the Veda. Their priests pretend to strict asceticism.

The *Kabīr Panthis* are a very numerous sect in Northern and Central India. They are strict Unitarians, believing in one sole Creator of the universe, perfect in holiness, omnipotence, irresistible, yet with corporeal form. All that is good in earth resembles him. The perfect man after death shares equally with Vishnu his perfection of character, blissfulness, and power. Indeed, God and man are identical. The whole visible creation is also God, begot by the female form, *Māya*, created by God, to relieve his loneliness and give birth to nature. They are very careful to teach that pure morality is the highest good and the way to God. Of all Vaishnavas they are certainly regarded as being most liberal. Revised by R. LILLEY.

Vaish'navism: the doctrines and practices of the VAISHNAVAS (*q. v.*).

Vaisya: See CASTE.

Valais văa'lā' (Ger. *Wallis*): canton of Switzerland; bounded N. by the cantons of Vaud and Berne, E. by Uri, Ticino, and Italy, S. by Italy, and W. by France. It consists of one valley inclosed by the Bernese and Pennine Alps, which are the highest mountains of Europe, and traversed by the Rhône, which at the western extremity of the valley enters the Lake of Geneva. Area, 2,027 sq. miles. Cattle-rearing and dairy husbandry are the chief occupations; at the bottom of the valley, where the summer heat is intense and the ground along the river level and fertile, wheat, wine, fine fruits, and excellent vegetables are cultivated with success. Capital, Sion or Sitten. Pop. of canton (1900) 114,980, of whom about 75,000 speak French, 15,000 German, and the rest Italian. They are nearly all Roman Catholics. Revised by M. W. HARRINGTON.

Vala'tie: village; Kinderhook town, Columbia co., N. Y.; on the Kinder. and Hudson Railway; 16 miles S. by E. of Albany (for location, see map of New York, ref. 5–J). It is at the junction of Kinderhook creek and the outlet of Kinderhook Lake; is principally engaged in the manufacture of paper and cotton, woolen, and tin goods; does its banking in Kinderhook, and has a weekly newspaper. Pop. (1880) 1,775; (1890) 1,437; (1900) 1,300.

Valckenaer, vaal'ke-năar, Lodewijk Kaspar: Greek scholar; b. at Leeuwarden, Holland, June 7, 1715; studied in Franeker and Leyden; Professor of Greek at Franeker 1741. In 1776 he was called to Leyden as the successor of his teacher, Hemsterhusius. D. at Leyden, Holland, Mar. 14, 1785. Valckenaer was one of the greatest classical scholars of modern times, and many of his contributions have a permanent value. His editions of the *Phœnissæ* (4th ed. 1824, 2 vols.) and the *Hippolytus* of Euripides, containing the famous *Diatribe in Euripidis perditarum fabularum fragmenta* (1768; 1823, 2 vols.), and of Theocritus, Bion, and Moschus (1781), mark an epoch in the critical and literary study of these poets. He also edited Homer's *Iliad* with the scholia (1747), and the fragments of Callimachus (published by Luzac, 1799). But his masterpiece is probably the *Diatribe de Aristobulo* (published posthumously by Luzac, 1806), in which the literary forgeries perpetrated by Alexandrian scholars are exposed. His *Opuscula critica* was published in 1809, *Selecta ex scholiis Valckenarii* in 1817. See Wyttenbach, *Vita D. Ruhnkenii*, pp. 175–181; Bergman, *Memoria Valckenarii* (Utrecht, 1874).

Valda, Giulia: See the Appendix.

Valdegamas, Marques de: See Donoso Cortés.

Val del Bove: See Etna.

Valdepeñas, vaăl-dā-pān'yaas: town; in the province of Ciudad Real, Spain; 140 miles by rail S. by E. of Madrid (see map of Spain, ref. 16–F). It is celebrated for its red wine, which is one of the best produced in Spain. Pop. (1887) 15,404.

Valdés, vaăl-dās', Alfonso and Juan, de: twin brothers; reformers; b. at Cuenca, Spain, about 1500, of a noble and wealthy family. Alfonso became private secretary to Charles V. and was present at the Diet of Worms 1521, at which Luther appeared, and also at the Diet of Augsburg 1530. He took the same stand as Erasmus toward the Reformation—applauding it so far as it was an attack upon the corruptions of the Church and having friendly relations with its leaders, but having no appreciation of it as a spiritual movement. He lived at the court of Brussels, but died in Vienna, Oct., 1532. In 1527 he wrote a dialogue called *Lactantius*, descriptive of the sacking of Rome by the Constable de Bourbon, and in it he exposed the ecclesiastical evils of the times. This was reprinted at Madrid in 1850.—Juan entered the imperial service in Spain, later was in that of the pope in Rome, Bologna, Naples, and other places. But he imbibed Reformation principles, produced a Spanish translation of Paul's Epistles, with a commentary, and numerous minor writings, all giving expression to his new views. He died in Naples in 1541, where he had lived a few years and where he gathered a little band which numbered Peter Martyr, Bernardino Ochino, Vittoria Colonna, and Giulia Gonzaga. They were accused by the Inquisition of having formed a sect called Valdesians, and some of his followers were put to death and others had to take refuge in foreign countries. The books of Valdés and his influence upon religious thought had fallen into almost complete oblivion, when his memory was revived by an English Quaker, Benjamin B. Wiffen (see *Bibliotheca Wiffeniana, Spanish Reformers*, by E. Böhmer, London, 1874; Eng. trans. of his *Christian Alphabet*, 1860; *Considerations*, 1865; *Spiritual Milk*, 1882; *Commentary on Matthew*, 1882), who began in 1848 the publication of a series of *Reformistas Antiguos Españoles*, which extended to 20 vols., and included, besides works of Tomas Carrasco and Dr. Juan Perez, several by Valdés, viz., *Dos Diálogos* (1850); *Zineto y Diez Consideraciones* (1550; reprinted 1855); *Alfabeto Cristiano*, from the Italian edition of 1546, with two modern translations in Spanish and English (1861); *Diálogo de la Lengua* (1546; reprinted 1860); and *La Epistola de San Pablo á los Romanos y la I á los Corintios, ambas traducidas y comentadas* (1556; reprinted 1856). The second of these works had been translated into French and Dutch, and had appeared in an English version by Nicholas Ferrar, with the title *Considerations on a Religious Life* (Oxford, 1638). Wiffen also published *The Life and Writings of Juan de Valdés, otherwise Valdesso, Spanish Reformer in the Sixteenth Century* (1865), with a translation from the Italian of his *Hundred and Ten Considerations* by John T. Betts. Valdés was not a Lutheran, nor did he question any doctrine of the Church, his title to the name of reformer resting upon his comprehensive spiritual fellowship with all genuine Christians. See an elaborate article on the Valdés brothers by E. Böhmer in Herzog's *Real-Encyklopädie für protestantische Theologie und Kirche*, and the same writer's *Cenni Biografici sui Fratelli Giovanni e Alfonso di Valdesso* (1861). Revised by S. M. Jackson.

Valdez, Melendez: See Melendez Valdez.

Valdiv'ia: a province of Chile, in the southern part, between Cautin and Llanquihue; extending from the Pacific to the crest of the Andes. Area, 8,315 sq. miles. The greater part consists of plains and rolling or hilly lands between the Andes and the lower Coast Range; portions near the mountains are well wooded. Until recently this region was held by the Araucanian Indians, the Government maintaining only a few posts. It is now rapidly developing as a grazing district. Pop. (1892) estimated, 62,020. Valdivia, the capital, is on the Calla-Calla river, near its mouth; its port is known as the Corral (see map of South America, ref. 9–C). It was founded as a frontier fort by Pedro de Valdivia in 1551; passed through many vicissitudes in the wars with the Araucanians, and was taken and destroyed by them in 1599, but was rebuilt in 1644. Later it was strongly fortified. During the latter part of the war for independence it was the last stronghold of the Spaniards; the patriots under Cochrane captured it by a brilliant assault lasting three days, Feb. 2–4, 1820. The harbor is well sheltered; the exports are cattle, hides, lumber, etc. Pop. about 9,000, including many Germans. H. H. S.

Valdivia, Pedro, de: conqueror of Chile; b. near La Serena, Estremadura, Spain, about 1498. He served as a soldier in Flanders, and under Charles V. in Italy. In 1534 he went to Venezuela, where he distinguished himself in various expeditions; later, it would appear, he was in Mexico, whence, in 1536, he passed to Peru in response to Pizarro's urgent call for re-enforcements against the Indians. He fought for Pizarro against Almagro, and took a prominent part in the defeat of the latter at Las Salinas. Chile had been granted to Almagro, who had made a fruitless expedition into it. After Almagro's death Charles V. intrusted the conquest of that country to an incompetent favorite, Pedro Sanchez de Hoz. On his arrival in Peru, Pizarro associated Valdivia with him, and by a subsequent arrangement Valdivia assumed the entire command. The force collected comprised 150 Spanish soldiers and several thousand Indians. It left Cuzco in Mar., 1540, and marched southward by the Atacama desert; in the valley of Mapocho a large force of Indians was defeated, and on Feb. 12, 1541, Valdivia founded Santiago. The Spaniards were repeatedly attacked by Indians, and were reduced to great straits, being cut off from Peru and almost starving. By the enterprise and bravery of a soldier, Gabriel Monroy, tidings of the situation were sent to Cuzco, and strong re-enforcements arrived in Dec., 1543. Thereafter the colony prospered. Valparaiso was founded in Sept., 1544, the coast was explored southward, and in 1546 Valdivia pushed into the Araucanian country to the Biobio river, defeating the Indians in a great battle. When tidings reached Chile of the rebellion of Gonzalo Pizarro in Peru, Valdivia left the command with Villagra and went to the aid of the royalist leader, Gasca, 1547–49. He took a leading part in the defeat of Pizarro, and was rewarded by a commission as governor of Chile. On his return he made several expeditions against the Araucanians, and to keep them in check founded Concepcion, Oct., 1550, and Valdivia and other posts in 1551–52. In Dec., 1553, there was a great uprising of the Indians, who laid siege to one of the new forts, Tucapel. Valdivia hurried to its relief with fifty horsemen, was attacked and defeated by the Araucanians, captured, and killed soon after, probably on Jan. 1, 1554. Herbert H. Smith.

Valdivieso, vaăl-dee-vee-ā'sō, or **Valdivielso**, José, de: Spanish dramatist who flourished during the first half of the seventeenth century; was a cleric attached to the cathedral of Toledo, and seems to have stood in close relations to Cervantes and Lope de Vega. His dramas, which are all religious, were published as *Doce autos sacramentales y dos comedias divinas* (Toledo, 1622). They were performed, and apparently enjoyed some popularity, which Ticknor would ascribe to the social position of the author rather than to any great merit in the plays themselves. Among their themes are such as *The Prodigal Son*; *Psyche and Cupid*, treated from the Christian standpoint; the *Tree of Life* and the *Angel Guardian*, both allegorical. Besides the dramas he composed a number of religious poems. Two are of considerable extent, the one devoted to St. Joseph, and the other written in honor of the Blessed Virgin.

J. D. M. Ford.

Valdos'ta: town (founded in 1860); capital of Lowndes co., Ga.; on the Ga. So. and Fla. and the Sav., Fla. and West. railways; 155 miles S. by E. of Macon, 157 miles S. W. of Savannah (for location, see map of Georgia, ref. 7–H). It is in an agricultural region, and has 6 churches, a collegiate institute for white pupils, 3 schools for colored children, a national bank with capital of $50,000, 2 State banks with combined capital of $250,000, and 2 weekly newspapers. The principal products of the region are cotton, sugar-cane, rice, corn, fruit, and sweet potatoes, and the town has important factories. The assessed valuation of property is $2,200,000. Pop. (1880) 1,515; (1890) 2,854; (1900) 5,613. EDITOR OF "TIMES."

Vale, vaa'lĕĕ, or **Ale**: in Scandinavian mythology, a son of Odin and Rind. He was brave in war; a most skillful wielder of the bow. In the Scandinavian mythology there is also a son of Loke and Sigyn called Vale. Loke's son Vale is a brother of Nare. R. B. A.

Valeggio sul Mincio, vaă-led'jō-sool-min'chyō: town; in the province of Verona, Italy; about 5½ miles E. of Villafranca; on the Mincio, affluent of the Po (see map of Italy, ref. 3–D). Within the town there are some noteworthy public and private buildings, and also some valuable works of art. Near Valeggio sul Mincio may be seen the ruins of the famous bridge of Borghetto (rather a causeway), erected (1393) by Gian Galeazzo to divert the Mincio from Mantua and thus reduce the place by famine. It was here also that on June 24, 1866, the Austrians defeated the Italians in the disastrous battle of Custozza. Pop. 2,110.

Valence (in chemistry): See CHEMISTRY.

Valence, vaă'lăăṅs' (anc. *Ventia*, later *Valentina*): capital of the department of Drôme, France; on the left bank of the Rhône; 65 miles S. of Lyons (see map of France, ref. 7–H). It is an old town, with narrow, crooked streets, but not unattractive. Its manufactures of silks, cotton goods, glassware, leather, gloves, etc., are flourishing, and its trade in wine and of the produce of the vicinity is brisk. It has a cathedral, founded in 212, containing the monument, with bust, by Canova, of Pius VI., who died here, and it has a museum of natural history and a collection of antiquities. Pop. (1891) 22,947; (1896) 26,212.

Valen'cia, or **Valentia**: a small island on the southwestern coast of Ireland, belonging to the county of Kerry; noted as the station of the two transatlantic submarine cables connecting Great Britain and Newfoundland. It is 5 miles long and 2 miles broad.

Valencia: a former kingdom of Spain, bordering on the Mediterranean and between Catalonia in the N. and Murcia in the S.; is divided into the three provinces of Valencia, Alicante, and Castellon de la Plana. From the eighth to the thirteenth century it was occupied by the Moors, and from the eleventh century to 1238 it was an independent Moorish kingdom. It is the best cultivated and most productive part of Spain. Nowhere in Europe are manuring and irrigation carried to such perfection as on the terraces of Valencia, where in some places the soil yields several harvests a year. Besides the common Spanish products, rice is grown here in sufficient quantity to supply all Spain; sugar also is cultivated. The country is watered by the Jucar, Requena, and Guadalaviar, and contains iron, lead, copper, cinnabar, cobalt, and coal. The lagoons on the coast, especially that of Albufera, are rich in sea-fowl and fish. The inhabitants, in whom a strong mixture of Moorish blood is apparent, are industrious, and, next to Catalonia, Valencia is the chief manufacturing part of Spain. Pop. (1897) 775,995.

Valencia: capital of the province of Valencia, Spain; on the Guadalaviar, near its mouth in the Mediterranean; 200 miles by rail S. W. of Barcelona (see map of Spain, ref. 16–I). Until 1871 it was surrounded by picturesque walls, the gateways of which remain. The houses are neat and substantially built; the squares, though small, are elegant; the streets, though crooked and narrow, are clean, well paved, and well lighted; while in the modern quarters there are broad and handsome thoroughfares. The whole city is a pleasant and enterprising place, the center of a fertile district, and the seat of an extensive trade and manufactures. Its cathedral, begun in 1262, is a vast edifice containing many excellent pictures. Its university is a well-endowed and well-attended institution, and has a good library. Its manufactures of silk, tobacco, sackcloth, and pottery are celebrated, and its export trade in grain, rice, oil, wine, almonds, figs, and oranges is very considerable. The huerta or garden surrounding the city comprises an area of about 40 sq. miles, and resembles an immense orchard, in which the citron, orange, palm, and mulberry grow luxuriantly. Pop. (1897) 204,768. Revised by M. W. HARRINGTON.

Valencia: capital and largest city of the state of Carabobo, Venezuela; beautifully situated in the Aragua valley, 2 miles W. of the Lake of Valencia or Tacarigua, and 24 S. of its port, Puerto Cabello (45 miles by railway); 1,824 feet above the sea (see map of South America, ref. 1–C). It is the third city of Venezuela in size and importance, and is the commercial center of a large region, exporting cacao, coffee, sugar, hides, etc.; the surrounding plantations are noted for their richness. The town is regularly laid out, has handsome parks and squares, and is lighted by electricity; it is a bishop's see, has a cathedral, national college, etc. The climate is warm (mean 77° F.). Near the city are celebrated springs in which the temperature approaches the boiling-point. Valencia was founded in 1555, or before Caracas. During the war for independence it was alternately held by the royalists and patriots. On the plain of Carabobo, S. of it, Bolivar gained the victories of May 28, 1814, and June 24, 1821, the latter deciding the independence of Venezuela. The first Venezuelan congress met here after the separation from Colombia. Pop. (1888) 38,654. Lake Valencia is 30 miles long and navigable, but is little used for commerce. It has several inhabited islands.
HERBERT H. SMITH.

Valencia, DUKE OF: See NARVAEZ, RAMON MARIA.

Valenciennes, vaă'lăăṅ'si-en': town; in the department of Nord, France; on the Scheldt; 155 miles N. E. of Paris (see map of France, ref. 2–G). It is fortified and defended by a citadel on an island in the river, and contains a modern Gothic church, and a town-hall surmounted by a square campanile. It was a residence of the Merovingian kings. It carries on a brisk trade in its own manufactures, which are varied and extensive. Sugar-refineries, dye-houses, bleaching establishments, and spinning and weaving factories are in operation. Laces and fine woven fabrics are made, and, being in the center of a rich coal-field, it has numerous foundries, rolling-mills, and machine-shops. Pop. (1896) 29,912. Revised by M. W. HARRINGTON.

Valenciennes, ACHILLE: anatomist and surgeon; b. in Paris, Aug. 9, 1794; studied natural science; became Professor of Anatomy at the Normal School in 1830; was the collaborator of Cuvier in his ichthyological studies; succeeded Geoffroy Saint-Hilaire in the Academy of Sciences. Besides a number of monographs and minor essays in various scientific journals, he wrote *Histoire naturelle des Mollusques, des Annélides et des Zoophytes* (1833). His most celebrated work, however, is *Histoire Naturelle des Poissons* (1829–49). This was begun in conjunction with Cuvier, after whose death it was carried on by Valenciennes, who left it incomplete, although he had extended it to twenty-two volumes. D. in Paris, Apr. 14, 1865.
Revised by F. A. LUCAS.

Valens: Roman Emperor of the East, 364–378 A. D., appointed by his brother VALENTINIAN I. (*q. v.*). A considerable part of the reign of Valens was devoted to the question of the Eastern boundary, but resulted in no definite settlement of it. In 376 the Goths were allowed to cross the Danube with a view to settling there peaceably, but they were treated with such perfidy and negligence of conditions by the representatives of the emperor that they sought restitution by force. After some reverses they defeated the Roman army, led by Valens, in the battle of Adrianople, in which the emperor lost his life. The Goths were thus permanently established S. of the Danube. G. L. H.

Valentia: See VALENCIA.

Valentine, MILTON, D. D., LL. D.: theologian; b. near Uniontown, Md., Jan. 1, 1825; graduated at Pennsylvania College (Gettysburg) 1850, and at the Lutheran Theological Seminary (Gettysburg) 1852; ordained to the ministry of the Lutheran Church Oct. 4, 1852; preached in Winchester, Va., 1853–54, and in Greensburg and Adamsburg, Pa., 1854–55; principal of Emaus Institute, Middletown, Pa., 1855–59; pastor of St. Matthew's church, Reading, Pa., 1859–66; became Professor of Ecclesiastical History and Church Polity in the Lutheran Theological Seminary 1866; president of Pennsylvania College 1868–84; since Sept. 24, 1884, Professor of Didactic Theology and chairman of the faculty in the Lutheran Theological Seminary; author of *The Relation of the Family to the Church*; *Justification by*

Faith; *The Dynamics of Success*; *Knowledge by Service*; *Truth's Testimony to its Servants*; *Is the Lord's Day only a Human Institution? Absolute Christianity*; *Natural Theology, or Rational Theism* (Chicago); and of numerous articles in the *Evangelical Review*, *Lutheran Quarterly*, *Homiletic Review*, *Magazine of Christian Literature*, *Quarterly Review of the Evangelical Lutheran Church*, of which he was co-ordinate editor 1871–76.

Valentine's Day, Saint: Feb. 14, observed in commemoration of St. Valentinus, a Christian martyr, who was decapitated in 270 A. D., during the Claudian persecution at Rome. The custom of sending valentines (sentimental or comic love-messages, often in rhyme, and adorned with ornamental or grotesque devices) is a very ancient one. Some tell us that on this day the birds select their mates; others trace the custom to the Roman Lupercalia (Feb. 15), when similar practices were observed. Traces of the custom have been detected among the observances of the northern pagans of ancient Europe. Hence it is not probable that the tradition ascribing its origin to a commemoration of the loving and charitable disposition of St. Valentine is the true origin of the observation.

Valentin'ian: the name of three Roman emperors. VALENTINIAN I. (364–375) was an officer under Julian and Jovian, and had risen to a prominent position when, on the sudden death of Jovian, he was raised to the imperial dignity by the officers of the army, at Nicæa. He made his brother VALENS (*q. v.*) Emperor of the East, and proceeded to Italy. He was a man of military talent, and a laborious and prudent administrator. His reign was chiefly occupied with campaigns in defense of the borders, and for a time he checked the inroads of the barbarians by successful operations in various parts of the empire—Britain, Africa, and the Germanic frontier. His favorite residence was Treves. He was succeeded by his sons Gratian and VALENTINIAN II., an infant of four at the time of his father's death. During the brief life of this emperor the imperial power rested in the hands of Gratian, until his death (383 A. D.), and afterward virtually in the hands of THEODOSIUS (*q. v.*), Emperor of the East. He died in 392 A. D.—VALENTINIAN III. (425–455), a son of Constantius and Placidia, the sister of Honorius, was only six years old when his uncle, Theodosius II., Emperor of the East, established him as Emperor of the West. His mother, who governed in his name, was entirely under the control of the clergy, and the empire suffered severely from the rivalry between Bonifacius and Aëtius. In spite of the great military ability of the latter, who defeated Attila at Châlons-sur-Marne in 451, the West Roman empire now began to crumble. Most of Africa fell into the hands of the Vandals; Britain was entirely given up; Merida in Spain was taken by the Suevi; and along the Rhine and the Danube one strong outpost after another was lost. In 450 Placidia died, and in 454 the emperor killed Aëtius with his own hand, jealous of his merits and afraid of his power. In the following year, however, Valentinian himself was murdered by Petronius Maximus on the Campus Martius in the midst of a great crowd which looked on with indifference. Revised by G. L. HENDRICKSON.

Valentinians: a Gnostic sect founded by Valentinus, supposed to have been an Egyptian by birth. He lived in Alexandria and Cyprus, and taught in Rome from 140 to 160. Of all the Gnostic systems, that of Valentinus was the most elaborate and the most interesting, and it was still further developed by his pupils, among whom were Ptolemæus, Secundus, Heracleon, Axionicus, and others. In this system the great mythological apparatus which the Gnostics employed is spiritualized, transformed into speculative elements, personifications of ideas, etc., and permeated with Christian ideas in regard to the love of the Father and the desire for communion with the Father. With this character of the system it was natural that the Valentinians should enter into a much closer connection with the pagan religions than any of the other Gnostic sects, as they considered paganism not as an aberration of the human mind, but as a divinely ordained preparative to Christianity. The principal source of knowledge of this sect is Irenæus, *Adversus Hæreses*. Revised by S. M. JACKSON.

Valentinois, Duchess of: See DIANE DE POITIERS.

Valen'za (anc. *Forum Fulvii Valentinum*): town; in the province of Alessandria, Northern Italy; on the right bank of the Po; 9 miles by rail N. of the city of Alessandria (see map of Italy, ref. 3–B). It was formerly a place of great strength, but its walls and fortifications were destroyed in 1805 by Bonaparte. The inhabitants are engaged in agricultural and manufacturing industries, and popular education receives considerable attention. Pop. 6,500.

Valera y Alcalá-Galiano, vaă-lā'raă-ee-aăl-kaă-laa'gaă-li-aa'nō, JUAN: statesman, novelist, and critic; b. at Cabra, near Cordova, Spain, Oct. 18, 1824. Of distinguished family, he was destined at first for jurisprudence; but he turned to diplomacy, and went as secretary of legation to Naples, Lisbon, Rio de Janeiro, Dresden, and St. Petersburg. Finding himself out of sympathy with the government of O'Donnell, he returned to Spain and became collaborator on the journal *El Contemporáneo*, the organ of the leader of the opposition, at that time Alvareda. In 1859 he was elected deputy, and soon after, Alvareda having succeeded O'Donnell, he became Minister of Commerce and Agriculture. When Narvaez came to power he lost his office, but a little later, O'Donnell having once more prevailed by the aid of a liberal programme, he was sent as ambassador to Frankfort. Here he remained till 1866. Returning to Spain, he took a prominent part in the revolution of 1868. He was twice Minister of Education under the new *régime*, and was one of the deputation that offered the throne to Amadeo of Savoy, Duke of Aosta, in 1870. Though a liberal, he did not sympathize with the effort to establish a republic which succeeded Amadeo's short reign. Upon the re-establishment of the monarchy in the person of Alfonso XII., he was again employed in the diplomatic service of Spain, going as ambassador to Lisbon, Washington, and Brussels. Returning once more to Spain, he was made senator and member of the Council of State. He is also a member of the Spanish Academy, and of many other literary and scientific bodies.

Though thus eminent in public affairs, the lasting fame of Valera will be mainly due to his work as a man of letters. His wide knowledge of the world, his acquaintance with the best thought of many countries, his cosmopolitan sympathies, make him notable; but, above all, his style—the most delicate, subtle, gay, and delightful to be found in any modern Spanish writer—insures him a high place in the literary history of his country. His literary *début*, apart from some scattered contributions to periodicals, was made in the volume *Poesías* (1858). Some of these poems show great felicity of expression; but prose was to be the true medium of his utterance. He began in the latter with criticism, and there appeared a succession of critical articles from his pen, which in 1864 he collected in the volume *Estudios críticos sobre literatura, política, y costumbres de nuestros días*. An ampler collection was *Disertaciones y juicios literarios* (1882), and this has been followed by *Nuevos estudios críticos* (1888); *Cartas americanas* (1889); and *Nuevas cartas americanas* (1890). Valera has obtained still greater success, however, as a novelist, and his *Pepita Jiménez* (1874); *Las ilusiones del doctor Faustino* (1876); *El comendador Mendoza* (1877); *Pasarse de listo* (1878); and *Doña Luz* (1878) are perhaps the most widely known and most frequently translated of all recent Spanish novels. In the short tale he has been no less fortunate, and several of the pieces in his collected *Cuentos, diálogos, y fantasías* (1882; new ed. 1887) are already, and deservedly, classics. There is also much that is extremely felicitous in his *Tentativas dramáticas* (1878; 3d ed. 1880). He is also the author of a translation into Spanish of Count von Schack's *Poesie und Kunst der Araber in Spanien und Sicilien*. The best collected edition of Valera's works is to be found in the *Colección de Escritores Castellanos* (7 vols., Madrid, 1886–90). A. R. MARSH.

Vale'rian [viâ O. Fr., from Late Lat. *valeria'na*, valerian, appar. from some person named *Vale'rius*]: a plant of the genus *Valeriana* (family *Valerianaceæ*). The most important species is *V. officinalis*, the root of which is used in medicine. This plant, called also the "great wild valerian," is a native of Europe, but is cultivated also in the U. S., in Vermont, New Hampshire, and New York. It is an herbaceous perennial plant, the stem being erect and round, rising from 2 to 4 feet, and bearing small white flowers in terminal panicles. The fruit is a capsule containing a single oblong seed. The root consists of an upright root-stock about as thick as the little finger, from which spring numerous slender cylindrical rootlets about 3 or 4 inches in length. This root, though nearly odorless when fresh, develops a strong and peculiar smell upon drying. The taste is somewhat bitter, acrid, and disagreeable. The important ingredient of the drug is a pale-greenish volatile oil (oil of valerian), which is present in the proportion of from 1½ to 2

per cent. This oil, when fresh, has but little smell, but on exposure it slowly acidifies, becomes yellow and thick, and acquires a strong valerian smell. There is developed a peculiar acid. (See VALERIC ACID.) This acid combines with bases to form soluble salts, which retain to a certain degree the odor of the acid. The active principle of valerian root is the volatile oil. This, in experiments upon animals, is found to deaden feebly the reflex excitability of the spinal cord. Upon man, preparations of valerian sometimes reduce undue nervous irritability, and are therefore resorted to in affections characterized by this condition, such as hysteria, chorea, and milder forms of so-called nervousness. The valerianates of ammonium, quinine, and zinc are official medicines, but their effect is inferior to that of the oil or preparations of the root. A curious property of valerian is the attraction of its smell for cats. These animals seem to snuff the plant from a long distance, and are said to be excited to a kind of frenzy by it, during which they display strong sexual excitement. Revised by H. A. HARE.

Valerian: Roman emperor from 253 to 260 A. D. His reign was unimportant, and he did little to check the dissolution of the empire. In an expedition against the Persians he was captured, and died several years afterward in captivity. G. L. H.

Valerianos, APOSTOLOS: See FUCA, JUAN, de.

Val'eric or **Valerian'ic Acid** [*valeric* (or *valerianic*) is deriv. of *valerian*, from the root of which inactive valeric acid is obtained]: a compound first obtained in 1817 by Chevreul from the fat of a dolphin, *Delphinum phocæna*, and by Grote in 1830 from the essential oil of VALERIAN (*q. v.*). It is also called *delphinic acid*, *phocenic acid*, and *butylcarbonic acid*. Its formula is $C_5H_{10}O_2$. In the vegetable kingdom it occurs in the berries of *Viburnum opulus*, in the angelica-root, in the root of *Athamanta oreoselinum*, and in the bark of the elder-tree; in the animal kingdom it is found in numerous animal oils and in the products of the oxidation of oleic acid and other fats. It is likewise contained in decayed cheese. The acid can be obtained by passing the vapor of amylic alcohol through a tube filled with a mixture of lime and soda, and heated to 400° F., and decomposing the sodium valerate produced by the distillation with sulphuric acid; but the best method for its preparation consists in the oxidation of amylic alcohol, which is accomplished by gradually adding a mixture of the alcohol and concentrated sulphuric acid to a solution of potassium dichromate, and heating the liquid in a flask provided with an inverted condenser, after which the liquid is distilled, and the distillate neutralized with sodium carbonate. The amylic valerate contained in the distillate is next removed by distillation, and the residue of sodium valerate is dissolved in water and distilled with sulphuric acid, when a fluid passes over consisting of an aqueous solution of valeric acid mixed with a hydrated acid containing 1 equivalent of water, from which it can be separated by redistillation. Valeric acid forms a limpid, colorless oil, possessing a sour, burning taste and a powerful odor, resembling that of valerian-root, also like that of rancid cheese and butyric acid. It has a sp. gr. of 0·955 at 32° F., remains liquid at 0° F., and boils at 347° F., the density of its vapor being 3·66. If the active modification of amylic alcohol is used for its preparation, the resulting acid exerts a rotatory power on polarized light. Valeric acid is sparingly soluble in water, but dissolves in all proportions in alcohol and in ether; also in concentrated acetic acid. It unites with water, forming a definite hydrate, $C_5H_{10}O_2.H_2O$, which is also produced upon decomposing a valerate with strong sulphuric acid. This hydrate is also oily, but it possesses a lower boiling-point than the anhydrous acid. When a mixture of calcium formate and valerate is submitted to dry distillation, *valeral* or *valeraldehyde* ($C_5H_{10}O$) is formed, this compound being also produced by the partial oxidation of amylic alcohol. Valeric acid is related to amylic alcohol in the same way as acetic acid is to ethylic or common alcohol, valeral being the compound corresponding to ordinary aldehyde. It is a monobasic acid, and forms neutral (also a few acid and basic) salts, which are obtained by direct saturation. The valerates are odorless when dry, but if moistened or treated with dilute sulphuric acid, they emit the characteristic and unpleasant odor of valeric acid; with the exception of silver and mercury valerates, they are soluble in water. Besides the form of valeric acid described, two other modifications have been obtained—one by the oxidation of normal amylic alcohol, the other from tertiary butylic alcohol.

Revised by IRA REMSEN.

Vale'rius An'tias: a Roman historian of the first century B. C. who was one of the chief sources of Livy. His voluminous history in at least seventy-five books, covering the period from the founding of the city down to Sulla, was characterized by great exaggeration. For the fragments, see H. Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883). M. W.

Valerius Flaccus, GAIUS: See FLACCUS, GAIUS VALERIUS.

Valerius Max'imus: a compiler of a large collection of historical anecdotes, *Factorum et Dictorum memorabilium Libri IX.*, dedicated to the Emperor Tiberius, which is still extant, as well as two epitomes of it made about the fifth century by Julius Paris and Januarius Nepotianus. During the Middle Ages the book, which is not without value to the student of history and antiquities, was much read and highly esteemed; there were fourteen distinct editions of it before 1490. Critical editions have been given by Hase (Paris, 1822), Kempf (Berlin, 1854, and Leipzig, 1888), and Halm (Leipzig, 1865). There is an English translation by W. Speed (London, 1678). Revised by M. WARREN.

Valerius Probus: See PROBUS, MARCUS VALERIUS.

Valet'ta: capital of the island of Malta; on a rocky promontory of the northeastern coast which forms two large, deep, and safe harbors (see map of Italy, ref. 11–F). These harbors, as well as the whole city, are strongly fortified by lines of works, mostly hewn into the rock, and defended by forts, of which St. Elmo, on the extremity of the promontory, is the most important. On account of its harbors and fortifications, Valetta has been made the station of the British fleet in the Mediterranean, and it is regularly visited by all steamers crossing this sea. Thus it became a point of great military and commercial importance, and although it has no manufactures and no natural resources, it is still increasing. It was named after its founder, Valette, Grand-master of the Knights of St. John, who defended it against the Turks in 1565. In the cathedral and palace are many interesting monuments from the times of the Knights of St. John. Valetta also has a university and a public library, both of which were founded by the knights. Pop. (1891), with the suburbs, 62,152. Revised by M. W. HARRINGTON.

Valette, vaä'let', JEAN PARISOT, de la: soldier; b. in 1494 in Toulouse, France; entered very early the order of St. John, and distinguished himself so much that in 1557 he was chosen grand-master of the order. In this rank he fought the Turks with great effect, and finally roused the wrath of the Sultan Suleiman to such a pitch that he determined to annihilate the order. Accordingly, a magnificent Turkish armament, consisting of over 150 vessels of war and 30,000 select troops, appeared off the coast of Malta before the fortifications of Valette on May 18, 1565, and a most memorable siege began. La Valette had between 8,000 and 9,000 men, but of these only 700 were knights; the rest were militia, the inhabitants of the island. With this force he resisted the furious attacks of the Turks until Sept. 8, when the number of his men had dwindled down to 600, and when the Viceroy of Naples arrived with re-enforcements. The Turks embarked; once more, however, they returned, but were completely routed and driven off. La Valette died in Valetta, Aug. 21, 1568. Revised by F. M. COLBY.

Val'gius Rufus: a Roman poet, friend of Horace, who was consul 12 B. C. He wrote not only elegies and epigrams, but also rhetorical, grammatical, and botanical treatises. For the scanty poetical fragments, see Baehrens, *Fragmenta Poet. Rom.* (Leipzig, 1886). M. W.

Valhal [from the Icelandic *Valhöll*, which means the hall of the slain; written also VALHALLA and WALHALLA (*q. v.*)]: in Scandinavian mythology, the most important and the most magnificent hall in Asgard, where Odin receives and welcomes the gods and all the *einherjes*, that is to say, the brave warriors, who fall on the field of battle. Valhal is large and resplendent with gold; spears support its ceiling; it is roofed with shields, and coats-of-mail adorn its benches. Swords serve the purpose of fire, and, according to the *Elder Edda*, it has 640 doors, each of which is so wide that 960 *einherjes* may enter side by side. Outside of Valhal stands the shining grove Glaser, the leaves of which are of red gold. The heroes in Valhal eat flesh from the boar Sæhrimner. This boar is cooked every morning and becomes whole again every night. The she-goat Heidrun stands above Valhal and feeds on the leaves of the famous tree Lerad, and from the teats of the she-goat flows mead in such abundance that every day a bowl, large enough to hold more than would

suffice for all the heroes, is filled with it. And still more wonderful is what is told of the stag Eikthyrner, which also stands over Valhal and feeds upon the leaves of the same tree. While he is feeding so many drops fall from his antlers down into Hvergelmer that they furnish sufficient water for the thirty-six rivers that issuing thence flow twelve to the abodes of the gods, twelve to the abodes of men, and twelve to Niflheim. See *The Prose Edda*, under EDDA, and SCANDINAVIAN MYTHOLOGY. RASMUS B. ANDERSON.

Valkyries, vaăl-keĕr'yāz [from the Icelandic *Valkyrjur*, i. e. choosers of the slain]: maidens sent out by the god of war Odin to every battle-field to make choice of those who are to be slain and to turn the tide of battle. They are also called VALMAIDS (*valmeyar*). The youngest of the norns, Skuld, also rides forth to choose the slain and turn the combat. The Valkyries serve in Valhal, where they bear the drink, take care of the drinking-horns, and wait upon the table. More than a dozen Valkyries are named in the *Elder Edda*. In the old sagas there are accounts of loves between Valkyries and earthly heroes, but such connections were not happy, being always followed by the premature death of the hero. See *The Prose Edda*, under EDDA. R. B. A.

Valla, LAURENTIUS (*Lorenzo della Valle*): humanist; b. in Italy in 1407, probably in Piacenza (though he delighted to call himself *Romanus*); educated in Rome by Lionardo Bruni and Aurispa; itinerant Professor of Rhetoric, Philosophy, and Classical Languages in Pavia, Milan, Genoa, Ferrara, and Mantua; was called to Naples by Alfonso V. in 1442. Owing to his denial of the apostolic authorship of the *Symbolum Apostolicum* and other equally heterodox demonstrations, he was accused of heresy and saved from death at the hands of the Inquisition only by the intervention of his patron, the king. Thereafter he was in Rome holding various important offices under Nicholas V. and Calixtus III., having also been appointed Professor of Rhetoric in Rome in 1450, where he died Aug. 1, 1457. In intellectual ability and lasting influence Valla is perhaps the greatest among his great humanist contemporaries. His audacity in combating long-cherished traditions in literary criticism no less than in religion made his life one of continual warfare and bitter controversy. His very first essay, a comparison between Cicero and Quintilian, to the great disparagement of the former, brought down upon him all the Cicero idolaters of the time, with Poggio at their head. Among the classical and theological writings of Valla only a few can be mentioned here. His Latin translations of Herodotus and Thucydides were justly celebrated, but his masterpiece is the *Elegantiæ Latinæ* (1444; 59th ed. 1536). It was for centuries the standard work on Latin style, a kind of court of appeals of correct usage. With its appearance the Latin language may be said to have ceased to be a living tongue. His *Adnotationes* to the New Testament, in which the Vulgate was for the first time subjected to a comparison with the Greek original, was re-edited by Erasmus, and the famous treatise *De falso credita et ementita Constantini Donatione* (1440) was republished by Ulrich von Hutten and dedicated to the pope. Cf. Joh. Vahlen, *Lorenzo Valla* (1870, 2d ed.) and *Laurentii Vallæ opuscula tria* (1870); G. Voigt, *Wiederbelebung des classischen Alterthums* (vol. i.); J. A. Symonds, *Renaissance in Italy*; Ch. Nisard, *Les gladiateurs de la République des lettres aux XVe, XVIe, XVIIe siècles* (1860); Mancini, *Laurentius Valla*; and M. Wolff, *Laurentius Valla, sein Leben und seine Werke* (Leipzig, 1893). ALFRED GUDEMAN.

Valladolid': capital of the province of Valladolid, Spain; on the Pisuerga; 150 miles by rail N. W. of Madrid (see map of Spain, ref. 14–E). It communicates by the Duero and a vast system of canals with the Atlantic and the interior. It is on a plateau, 2,100 feet above the level of the sea, and noticeable on account of its healthful and genial climate. The surrounding district is very fertile and has abundant water for purposes of irrigation. The city was from the beginning of the fifteenth century till 1560 the capital of the Spanish empire, and had at that time over 100,000 inhabitants. It was adorned by Charles V. and Philip II. with many magnificent buildings. After the removal of the royal residence to Madrid, it fell into decay, and many of its buildings were much damaged by the French soldiery under the occupation in 1810. Its manufactures of silk, yarn, perfumery, pottery, paper, and leather have been enlarged and its trade has increased. Its university was founded in 1346, and in 1894 had 900 students. It is celebrated as a school of jurisprudence. Pop. (1897) 68,746. Revised by M. W. HARRINGTON.

Valladolid: See COMAYAGUA and MORELIA.

Vallanc'ey, CHARLES, LL. D. (originally *Vallence*): antiquarian writer; b. in England in 1722; entered the Royal Engineers and attained the rank of general in 1803; was stationed several years in Gibraltar, but for the most of his life in Ireland. D. in Dublin in Aug., 1812. He was an earnest but over-ardent student of the Irish language and Irish antiquities, and aimed ever at results which in the present advanced knowledge of philological principles appear most fantastic. Besides translations of two engineering treatises from the French, he produced the *Collectanea de Rebus Hibernicis* (6 vols., 1770–1804), consisting of antiquarian researches, etc.; an *Essay on the Antiquity of the Irish Language, etc.* (1772); a *Grammar of the Iberno-Celtic or Irish Language, with an Essay on the Celtic Language* (1773); an *Essay towards illustrating the Ancient History of the Britannic Isles* (1786); the *Ancient History of Ireland proved from the Sanscrit Books of the Bramins of India* (1797). He also reprinted an excerpt from the *Collectanea*, the *Vindication of the Ancient Kingdom of Ireland*, and issued a *Prospectus of a Dictionary of the Language of the Aire Coti or Ancient Irish, compared with the Language of the Cuti, or Ancient Persians, etc.*
Revised by J. D. M. FORD.

Vallan'digham, CLEMENT LAIRD: politician; b. at New Lisbon, O., July 29, 1820: received an academic education and taught school; studied law, and was admitted to the bar in 1842; was member of the Ohio Legislature 1845–46; edited the Dayton *Empire* 1847–49, after which he devoted himself especially to politics. He was elected a representative in Congress in 1857, and re-elected for two subsequent terms. He was especially active in opposing the measures of the national Government in carrying on the civil war. Failing of re-election in 1863, he returned to Ohio, where at public gatherings he denounced the Government with great vehemence; was arrested by order of Gen. Burnside, who commanded the department of the Ohio; tried by court martial in Cincinnati and sentenced to close confinement during the war—a sentence which President Lincoln commuted to banishment beyond the lines. Dissatisfied with his reception by the Confederates, he made his way to Bermuda, thence to Canada, and while there was nominated by the Democratic party as Governor of Ohio, but was defeated by more than 100,000 votes. He soon returned to Ohio, was not molested, and in 1864 was an active member of the national Democratic convention at Chicago. D. at Lebanon, O., by the accidental discharge of a pistol in his own hands, June 17, 1871.

Vallauri, vaăl-low'rĕĕ, TOMMASO: classical scholar; b. at Chiusa di Cuneo, Italy, Jan. 23, 1805; studied in Turin and was appointed professor at the university there in 1843; a very prolific author and one of the foremost of modern Italian philologians, and distinguished for his elegant Latin style. Among his works are editions of Horace, Cicero's orations, Sallust, Curtius, and several plays of Plautus; *Historia critica litterarum Latinarum* (13th ed. 1888); *Epitome historiæ Græcæ* (10th ed. 1887); *Epitome historiæ Romanæ* (5th ed. 1876); *Storia della poesia in Piemonte* (2 vols., 1841); *Storia della università degli studi del Piemonte* (3 vols., 2d ed. 1875); *Opuscula varia* (1875 and 1876). See his *Autobiography* (Turin, 1879). A. G.

Vallejo, vaa-lā'ho: city; Solano co., Cal.; on an arm of San Pablo Bay, opposite Mare island navy-yard, and on the S. Pac. Railroad; 26 miles N. E. of San Francisco (for location, see map of California, ref. 7–C). It is in an agricultural region; has a spacious harbor; and contains water, gas and electric-light plants, a State bank with capital of $95,000, 2 daily and 2 weekly newspapers, public library, orphan asylum, shipyards, terra-cotta works, iron-foundries, and machine-shops. Large quantities of grain are shipped from this point. Pop. (1880) 5,987; (1890) 6,343; (1900) 7,965. EDITOR OF "EVENING CHRONICLE."

Vallentine, BENJAMIN BENNATON: journalist and author; b. in London, England, Sept. 7, 1843; educated in Birmingham; studied for the English bar; traveled extensively; was one of the founders of *Puck* and its editor 1877–84; has been connected editorially with various New York newspapers; is a dramatic critic of *The New York Herald*; author of *The Fitznoodle Papers* (1882); *Fitznoodle in America* (1885); *The Lost Train* (1894); and other stories, besides several dramas, of which *Lord Fitznoodle* met with considerable success.

Valle'ria, ALWINA (full name *Alwina Valleria Lohmann*): opera-singer; b. in Baltimore, Md., Oct. 12, 1848; studied at the Royal Academy of Music, London, where she made her first appearance June 2, 1871. She sang in Italian opera in St. Petersburg, Milan, various German cities, London, and New York. From 1882 till 1886 she was with the Carl Rosa English Opera Company, creating the parts of Nadeschda in Goring Thomas's opera of that name and Margarida in Mackenzie's *Troubadour*. In 1877 she was married to R. H. P. Hutchinson, of Husband's Bosworth, near Rugby, England. D. E. HERVEY.

Valle y Caviedes, vaal'yā-ce-kăă-vĕĕ-ā'dās, JUAN, del: satirical poet; b. at Lima, Peru, in 1652. He inherited a considerable fortune, and was in Spain 1672–75; subsequently he led a very dissipated life, and at one time was forced to keep a small shop for a living. Grief caused by the loss of his wife plunged him into fresh excesses, and he died in Lima in 1692. He is known only for his *Diente de Parnaso*, first published in 1874. It is a biting satire directed against physicians, and is regarded as one of the most notable poems of its kind in Spanish. H. H. S.

Valley City: village; capital of Barnes co., N. D.; on the Cheyenne river, and the Minn., St. P. and Slt. Ste. M. and the U. Pac. railways; 14 miles E. of Sanborn, and 58 miles W. of Fargo (for location, see map of North Dakota, ref. 3–F). It is in an agricultural, dairying, and stock-raising region, and contains the State Normal School, a national bank with capital of $50,000, and a monthly and four weekly periodicals. Pop. (1880) 302; (1890) 1,089; (1890) 2,446.

Valley Falls: city; Jefferson co., Kan.; on the Delaware river, and the Atch., Top. and S. Fé., the Kan. City, N. W., and the Union Pac. railways; 25 miles N. E. of Topeka, and 35 miles W. of Leavenworth (for location, see map of Kansas, ref. 4–I). It is in an agricultural region; has excellent water-power, which is utilized by several mills and factories; and contains a large grain elevator, a State bank with capital of $10,900, 2 private banks, and 2 weekly newspapers. Pop. (1880) 1,016; (1890) 1,180; (1900) 1,078.

Valleyfield: a town in Beauharnois County, Quebec, Canada; near the head of the Beauharnois Canal, built to avoid the rapids on the St. Lawrence; 6 miles from Coteau Landing, which is on the northern side of the river, and 38 miles from Montreal (see map of Quebec, ref. 5–B). The Grand Trunk Railway connects Valleyfield with Montreal by the Victoria Bridge route, the Canada Atlantic crosses the river here by a magnificent bridge, and the N. Y. Cent. and Hud. Riv. Railroad has a branch ending at Valleyfield. The water-power is extensive and profitably utilized by a cotton-mill, that employs 1,500 people. The place is the residence of a Roman Catholic bishop. Besides the cathedral there are several fine public buildings, including a handsome school-house. Pop. (1891) 5,516. J. M. HARPER.

Valley Forge: village; Schuylkill township, Chester co., Pa.; on the Schuylkill river, and the Phila. and Read. Railroad; 4 miles S. E. of Phœnixville, 24 miles W. of Philadelphia (for location, see map of Pennsylvania, ref. 6–I). It was here that the American army under Washington encamped from the middle of Dec., 1777, till June 18, 1778, when it started in pursuit of the British across New Jersey. Washington selected the place for winter quarters in order to protect the Congress which, on the occupation of Philadelphia by the British, had adjourned from that city to York. It was here also that Baron Steuben assumed the office of inspector-general of the army, and that Washington announced, May 6, 1778, the treaty of alliance with France. The American troops numbered about 11,000, of whom only about half were fit for active service, and all suffered severely from cold and hunger during the winter. Steps have been taken to secure the site of the encampment for a national reservation.

Valleys: lowlands partly or wholly surrounded by uplands. The term is sometimes used (1) in a broad sense so as to include all depressions of the land surface, not excepting the narrow gorges of streams, but is more commonly restricted to (2) depressions of considerable size with bottoms of gentle slope as compared to the sides. It is also applied to (3) the catchment areas of streams, and in this sense is synonymous with basins. Under the first meaning, gorge, cañon, glen, dale, crater, etc., are subordinate varieties, and the term *valley proper* is ordinarily used to designate the type covered by the second meaning. In this article the second definition is assumed. Valleys exhibit great variety in configuration, climate, vegetation, structure, and physical history. They rival plains in adaptation to the needs of man, and as they abound in all parts of the earth they hold a large share of the human population.

The student of physical geography, watching the gradual washing down of slopes by rains and rivers, observes that the whole surface of the land would be reduced to a monotonous plain if there were no compensatory agencies whose work tended toward diversity of surface. The agencies which initiate diversity are of two types, both operating beneath the surface. By diastrophic forces the earth's crust is wrinkled or fractured and thus thrown into ridges; by volcanic forces molten rock is made to issue at the surface and build up mountains and tables. The depressions between mountains thus constructed are valleys, and yet other valleys are hollowed out of uplifted plateaus by the action of streams of water or streams of ice. Valleys may thus be classified according to mode of origin as diastrophic, volcanic, aqueous, and glacial. The physiographic processes to which they owe their origin are described in GEOLOGY and PHYSIOGRAPHY (*qq. v.*).

Diastrophic Valleys.—When a portion of the earth's crust having a plain surface is subjected to powerful forces acting from one side, its compression results in the production of a series of wrinkles on the surface, and the plain is replaced by a parallel system of ridges and valleys. The valleys may sometimes be depressed below the original level of the plain, but ordinarily their depression is only relative as compared to the adjacent ridges, and they are actually somewhat lifted. If the deformation were rapidly produced the valley sides would be smooth and even; but in all known instances the change of form has been so gradual that the bounding ridges have been deeply carved by streams during the period of their uplifting, and the valley walls are consequently irregular, with many salients and re-entrants. The origin of the valley is therefore not fully revealed by its configuration, but requires for its determination a study of the rock structures. Valleys of this simple type exist in the Jura Mountains of Europe, but are unknown in North America. Often the compressive forces, instead of merely flexing the rocks, break them into huge blocks, which are so displaced as to produce ridges and valleys at the surface. Sometimes the fractures are vertical, and the blocks are unevenly lifted; sometimes the fractures are somewhat oblique, and each block is tilted so as to have one edge lower than the other; sometimes the fractures are highly inclined, and one block is made to slide over another. Thus the greatest diversity of configuration is produced, and the resulting valleys may be long narrow troughs or comparatively short and broad. As a rule, one or more of the valley walls is cliff-like, but such original character may be destroyed by contemporary erosion. The U. S. affords many examples. The great valley of California, caused by the uplift of the Sierra Nevada at the E. and the Coast Ranges at the W., is 400 miles in length and 50 or 60 in width. Its bottom is a great plain leveled by the spreading of detritus washed down from the adjacent mountains, especially from the Sierra, which is lofty and broad. In the region of the Desert Ranges, which occupy the greater part of Nevada, Arizona, and New Mexico, parallel narrow mountain ridges stand 20 or 30 miles apart and divide the land into a great number of valleys. The detritus eroded from the mountains is received by the valleys and has been accumulated to great depth, so that all the down-thrown blocks, as well as the lower margins of the tilted blocks, are buried from sight. Rainfall in that region is small, and comparatively little of the drainage finds its way to the ocean. During periods of storm many of the valleys hold temporary lakes by which the detritus is spread in level plains, and from these valley floors alluvial slopes rise, at first gently and then more steeply, to the mountain bases. Other valleys, lying somewhat higher and discharging their storm waters to lower neighbors, are traversed midway by water channels, usually dry, from which long alluvial slopes rise to the bordering mountains. In the Rocky Mountains of Colorado, and to a certain extent in the mountains of Montana and Northern Idaho, the valley troughs lie so high that their bottoms are still more thoroughly drained, and from these most of the alluvium is carried away, so that the valley floors are narrow.

Volcanic Valleys.—Where eruption takes place from many vents in the same district, the accumulation of the ejected material is apt to be irregular, and among its heaps valleys are sometimes inclosed. The San José valley of Costa Rica

is of this type. Large craters, due either to explosion or subsidence, occasionally assume the character of valleys. The Val del Bove, on the flank of Mt. Etna, is believed to be an explosion crater, and the Asosan valley of Japan, described by Milne, is probably a crater of subsidence.

Aqueous Valleys.—As soon as any mountain ridge or plateau is lifted above the surrounding plain, its erosion is begun by the streams which flow from it or across it. Those streams whose original directions coincide with the slopes produced by the uplift have their grades increased, and are thus stimulated to erosive activity; they cut their channels deeper, and their courses are soon so far below the general level that they can not easily be diverted. Streams flowing in such directions that the newly created slopes diminish their grades have their erosive power impaired. They are diverted to new courses unless they have great volume, in which case they may hold their places, sawing deep cuts through the upland as it rises. The diverted streams also begin the work of trenching along their new courses; and thus the whole drainage system of the rising tract comes to flow in gorges. When uplift ceases the streams continue to deepen the gorges, but after a time the work of other agents acquires greater relative importance. The walls of the gorges are attacked by frost and various other agencies that break up rocks, the fragments are washed into the streams and carried away, and thus the walls recede and assume gentler slopes. The slopes become gentlest near the streams, so that the V representing the cross profile of the gorge is converted into a shallow U. The reduction of the slopes lowers the crests of the ridges between the streams and especially between the minor tributaries. At the same time the main streams, losing the power to cut downward as they approach BASE LEVEL (*q. v.*), work laterally and develop flood-plains. Thus the gorges are converted into valleys. The position of each valley is determined by the position of its stream, and the valley is coextensive with that part of the stream basin which lies within the uplifted tract. Its perfect development depends on uniformity of rock texture, and as such uniformity rarely characterizes a great uplifted mass, the type is not readily illustrated by large examples. The processes of disintegration are resisted so much more stubbornly by some rocks than by others that in most cases the widening of a gorge proceeds at very different rates in different parts, and the valley phase is not reached everywhere at once. Most long streams traversing uplifted tracts pass from gorge to valley and from valley to gorge in alternation, each valley having its position determined in part by the stream, but chiefly by the presence of yielding rocks. The rivers of the Appalachian region have this general character, crossing sandstone and crystalline formations in narrow gorges and being bordered by valleys where the formations are of shale or limestone. The influence of rock texture is felt in yet another way. The divide between two streams is attacked by the storm rills tributary to both, and the rills having the steeper grade work the faster, enlarging the catchment basin of their stream. Thus all streams strive for territory. If contesting streams are equal in volume, length, etc., and traverse rocks of the same sort, their common boundary is stable; but if one of them encounters rocks of exceptional resistance its downcutting is retarded, its head-water grades become low, and its rival encroaches on its territory. (See *Migration of Divides* under RIVERS.) The general result of such encroachments is that small streams cease to cross hard rocks, resistant ledges come to be occupied by divides, and the outcrops of yielding rocks come to be occupied by streams and their valleys. Where an extensive tract of yielding rock is surrounded by more resistant formations, the readjustment of drainage may leave more than one stream valley within the tract, but in such case the divides between the stream valleys are low, and they constitute collectively a great valley coextensive with the yielding rock. The great Appalachian valley, extending from New York to Alabama, is of this type, the determining rock being a limestone which is rapidly degraded by solution.

Glacial Valleys.—Streams of ice also have power to make valleys by eroding soft rocks and leaving hard, but it is not easy to discover one which they have initiated. The valleys in which ice-work is recognized were temporarily occupied by glaciers in the Pleistocene period, but most or all of them had been previously occupied by rivers. Nevertheless the mountain glaciers were important valley-makers, for they broadened the bottoms of their channels and thus converted gorges into valleys. Yosemite, the mountain valleys of Tuolumne, Kern, and King rivers of California, and the Scottish glens were thus transformed by glacial erosion. See GLACIERS and PLEISTOCENE PERIOD. G. K. GILBERT.

Vallisne'ria [named in honor of Antonio Vallisneri (1661–1730), an Italian botanist]: a genus of plants of the family *Hydrocharideæ*. *V. spiralis*, a water or marsh plant common in the U. S. and in the south of Europe, is remarkable for its curious process of fecundation. The fertile or pistillate plants put up long, spirally twisted flower-stalks, which allow the flowers to float upon the surface; but the male flowers are held to the bottom by their short stems. Accordingly, when the proper time for fertilization comes, the sterile or staminate flowers break their stems, rise, float upon the surface, and shed their pollen around the fertile flowers. The spiral stems of the latter (which are from 1 to 4 feet long) then contract and draw the fertilized germ under water, where it is perfected. The plant is abundant in Chesapeake Bay, where it is called wild celery, and upon its roots the canvas-back duck feeds. Other species are found in Australia, etc. Revised by CHARLES E. BESSEY.

Vallisneria spiralis—staminate and pistillate.

Vallombro'sa [Ital.; *valle*, valley + *ombrosa*, fem. of *ombroso*, shady]: a former Benedictine monastery in a valley of the Apennines, 15 miles E. from Florence. It was founded by St. John Gualbert in 1039. The present noble buildings were erected in 1638. This ancient and celebrated establishment acquired great wealth, but in 1869 it was suppressed by the Italian Government, which converted the buildings into a royal school of forestry. The order was the first to introduce lay brothers.

Valmore, vaăl'mōr', MARCELINE FÉLICITÉ JOSÈPHE DESBORDES: actress and author; b. at Douai, department of Nord, France, June 20, 1785; was educated in Guadeloupe; made her first appearance on the stage as a singer after her return to France; married the tragedian Valmore in 1817; left the stage subsequently, and devoted herself to literature. She published several volumes of poems, *Élégies et Romances* (1818); *Élégies* (1824); *Les Pleurs* (1833); *Pauvres Fleurs* (1839); also several novels, including *L'Atelier d'un Peintre* (2 vols., 1833); *Le Salon de Lady Betty* (2 vols., 1836). See Sainte-Beuve, *Madame Desbordes-Valmore* (1870; translated into English by Harriet W. Preston, Boston, 1872). D. in Paris, July 23, 1859. Revised by B. B. VALLENTINE.

Valmy, vaăl'mee', FRANÇOIS CHRISTOPHE KELLERMANN, Duke of: general; b. near Rothenburg, in Bavaria, May 28, 1735; served in the Seven Years' war, and was *maréchal-de-camp* when the French Revolution broke out in 1789. In 1791 he became general of the army of Alsace, and in the following year commanded the army of the Moselle. After joining Dumouriez he gave battle to the allies at Valmy (Sept. 20), where he gained one of the most important victories of this period. It secured France from invasion, and enabled the Convention to go on with its radical measures. Kellermann, being a moderate republican, was arrested in 1793 on suspicion of being lukewarm in the service of the Convention, and not taking vigorous measures against the city of Lyons, which he had been ordered to reduce. He remained in prison until the Thermidor reactionary revolution in 1794. After the first Italian campaign was well under way (1795), the Directory purposed to send Kellermann to share with Napoleon the responsibilities of the command, but the latter refused to go, saying that one bad general was better than two good ones. Kellermann commanded the army of the Alps, but found little opportunity to distinguish himself. In 1804 Napoleon made him Duke of Valmy, but in 1814 Kellermann voted for his deposition, and supported the restored Bourbons, who confirmed his title of duke, and made him a peer of France. D. Sept. 12, 1820. His son, FRANÇOIS ÉTIENNE KELLERMANN, Duke

of Valmy (1770–1835), is noted especially for his brilliant cavalry charge at the battle of Marengo in 1800. He also distinguished himself at Austerlitz and in the Waterloo campaign.

Valois, vaă'lwaa': the name of a dynasty of France (1328–1589), so called from the ancient county of Valois, constituting a part of the present departments of Oise and Aisne. In 1285 Philip III. gave the county of Valois to his younger son, Charles (b. 1270; d. 1325), and when the direct line of the Capetian dynasty died out in 1328 with Charles IV., the eldest son of this Charles of Valois ascended the French throne under the name of Philip VI., and founded the dynasty of Valois. In direct succession from father to son the crown was borne by John the Good (1350–64), Charles V. (1364–80), Charles VI. (1380–1422), Charles VII. (1422–61), Louis XI. (1461–83), and Charles VIII. (1483–98). Charles VIII. having no male heirs, the crown fell to Louis XII. (1498–1515), the representative of the nearest collateral line, a grandson of Duke Louis of Orleans, the younger brother of Charles VI. As Louis XII. also died without male issue, the succession devolved once more upon a collateral line, and Francis I., a great-grandson of Duke Louis of Orleans, through his younger son, Charles of Angoulême, ascended the throne (1515–47). He was succeeded by his son, Henry II. (1547–59), who was married to Catherine de' Medici, and he again by his three sons—Francis II. (1559–60), Charles IX. (1560–74), and Henry III. (1574–89), with whom all the male lines of the house of Valois died out, and the French crown fell to the house of Bourbon, descending from Robert, the younger brother of Philip III., and represented by Henry IV., King of Navarre. The most prominent events during the reign of the house of Valois were the HUNDRED YEARS' WAR (*q. v.*) with England, the wars of conquest in Italy, and finally the civil or religious wars. Philip VI. ascended the throne, according to Salic law, as the nearest male heir of the Capet family, but his right was disputed by the English king, Edward III., who claimed the French throne for himself as a son of Isabel, daughter of Philip IV., arguing that the Salic law, although it excluded females from the succession, did not prevent them from transmitting a legitimate claim to their male heirs. Charles VII. finally succeeded in driving the English out of the country, but the English kings continued to bear the title of Kings of France up to George III. The Italian wars began under Charles VIII. with his conquest of Naples in 1495. Charles of Valois, the founder of the family, was first married to Margaret of Anjou-Sicily, by whom he obtained the counties of Anjou and Maine, and some very slender claims on the kingdom of the Two Sicilies. As his second wife he married Catherine of Courtenay, by whom he obtained some still thinner claims on the Byzantine empire, and he actually assumed the title of Emperor of Constantinople. On the basis of these claims, Charles VIII., two centuries later, invaded Naples, and meditated an attack upon the Turks from there. It was the idea of a world-empire, the ghost of the Roman empire, which haunted him. The last three kings of the house of Valois, the sons of Catherine de' Medici, were ruled by their mother, who in this way retained the supreme power in her control. The civil and religious wars were not the work of the Valois; they originated in Rome and the Escurial. See HUGUENOTS; also the biographical articles on the various kings. Revised by F. M. COLBY.

Valois, CHARLES, de: See ANGOULÊME, CHARLES DE VALOIS, DUKE d'.

Valparaiso, văl-paă-rī'zō (Span. pron. vaăl-paă-raă-ee'sō): a city and port of Chile, and the most important seaport of the Pacific coast of South America; on a bay in lat. 33° 1′ S.; 68 miles (116 miles by rail) W. N. W. of Santiago (see map of South America, ref. 8–C). The harbor is commodious, but it is open to northerly storms; a breakwater and other improvements have been projected, and are completed in part. Originally, the town was on a strip of flat land fronting the water, and now occupied by the business portions; beyond this it has spread up the hillsides in many charming suburbs, the residences of the richer class; and Viña del Mar, a little to the E., is a noted seaside resort. Valparaiso is substantially built, clean, and pleasant, but it has few notable buildings. It is almost exclusively a commercial city, greatly surpassing Santiago in this respect. In 1890 1,270 vessels entered the port, representing a tonnage of over 1,200,000. There is a large foreign population, and much of the trade is in the hands of British merchants. Most of the imports and a large part of the exports of Chile pass through Valparaiso. The Government maintains here a naval arsenal, a naval school, etc., and the port is strongly fortified. There is cable communication with the northern coast and the U. S. Valparaiso was founded in Sept., 1544, was several times sacked by English and Dutch corsairs in the sixteenth century, and has suffered greatly from earthquakes and fires. On Mar. 31, 1866, it was bombarded by a Spanish fleet. The concluding battles of the civil war of 1891 were fought in its vicinity, and it was taken and partly sacked by the congressional troops Aug. 28. Pop. (1901) about 150,000. It is the capital of the province of Valparaiso, which has an area of 1,637 sq. miles and a population (1895) of 220,756. HERBERT H. SMITH.

Valparaiso: city; capital of Porter co., Ind.; on the Chi. and Gr. Trunk, the N. Y., Chi. and St. L., and the Penn. railways; 22 miles S. W. of La Porte, and 44 miles E. of Chicago (for location, see map of Indiana, ref. 2–C). It is in an agricultural region; contains the Northern Indiana Normal School, 6 churches, 2 large public-school buildings, 2 national banks with combined capital of $150,000, a State bank with capital of $35,000, and 2 daily and 3 weekly newspapers; and has an iron-foundry, machine-shops, and Iceland moss and self-winding clock factories. Pop. (1880) 4,461; (1890) 5,090; (1900) 6,280.
EDITOR OF "MESSENGER."

Valpy, ABRAHAM JOHN: classical scholar; b. at Reading, England, about 1787; educated at Pembroke College, Oxford; began business in London as a publisher and bookseller about 1808; was the publisher of several of the works of his uncle Edward and of his brother Frederick; originated *The Classical Journal* (1810) and *The Museum* (1822–25); brought out Barker's edition of Stephens's *Thesaurus* (8 vols., 1815–25); *The Family Classical Library, a Series of English Translations*, etc. (52 vols., 1830–34); and a magnificently illustrated *Shakspeare* (15 vols., 1832–34); but the most valuable of his literary enterprises is his *Variorum* edition of the *Latin Classics* (141 vols., 1819–30). D. in London, Nov. 19, 1854. Revised by ALFRED GUDEMAN.

Value: See POLITICAL ECONOMY.

Valued Policy Laws: See FIRE-INSURANCE (*Insurance Legislation*).

Valve [= Fr. < Lat. *val'va*, leaf of a double door, plur. *val'væ*, folding-doors]: a cover to an aperture in a fluid-containing vessel, or a movable piece, like a door or gate, in a tube, so fitted as to permit when open, or to prevent when shut, the passage of a liquid, vapor, or gas into, from, or through the vessel or pipe.

Valves may be classified according to the method by which they are operated, as (1) by hand; (2) by independent mechanism; (3) by the motion of the machine which they regulate, such as a steam-engine; (4) by the action of the fluid, as safety-valves. They may also be classified with regard to the relative motion of the valve and its seat, as flap-valves, which rotate in opening; lift or puppet valves, which rise perpendicularly to the seat; and sliding-valves, which open parallel to the seat. They are also sometimes distinguished by the form of the moving part of the valve, as piston-valves, disk-valves, ball-valves, etc.

Probably the most ancient form of valve is the leather flap-valve, commonly used in small pumps, as shown at A, Fig. 1. The leather may be stiffened by a piece of wood or metal, as shown in the cut, one edge being left unstiffened to form the hinge. The rim of the aperture on which the valve rests when shut is called the valve-seat, and the portion of the valve which rests on the seat is called the face. Another form of valve, shown at B, Fig. 1, is called the disk-valve; this is a simple disk, frequently an annular disk, of metal, leather, or some other substance, which opens by a slight vertical lift. Both of these valves are automatic in their action—that is, they are moved by the motion of the liquid or gas in the pump. The piston or bucket being raised, the pressure of the fluid in the chamber above B keeps it closed, while the suction or partial vacuum formed in the chamber beneath B causes the flap-valve, A, to open. When the bucket is lowered the flap-valve shuts and, the pressure beneath B then becoming greater than the pressure above it, B opens, allowing the fluid to pass through the bucket. A flap-valve made entirely of metal is frequently used, as in the check-valve (Fig. 2). This is used to allow water to

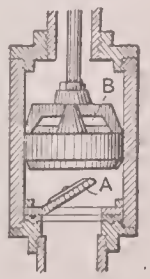

FIG. 1.

flow from A to B, when the pressure at A is greater than that at B, and to prevent the flow in the reverse direction when the pressure at B is the greater.

Fig. 3 is a steam stop-valve. This is a disk-valve placed upon a spin-

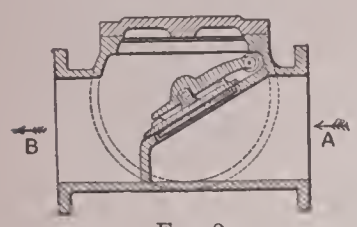

Fig. 2.

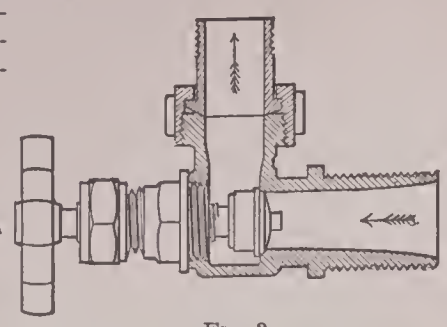

Fig. 3.

dle, which is operated by a screw and hand-wheel. The smooth portion of the spindle to the left of the screwed portion passes through a packed stuffing-box, which prevents the leakage of steam around the spindle. A common form of valve for water-pipes, called a gate-valve, is shown in Fig. 4. The gate is a flat plate which slides in a grooved casing placed transversely to the axis of the pipe. A special form of gate-valve is shown in Fig. 5. In this there are two plates which are tightly

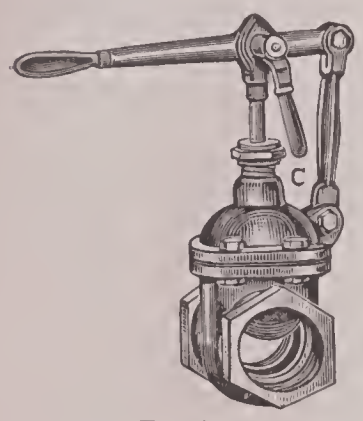

Fig. 4.

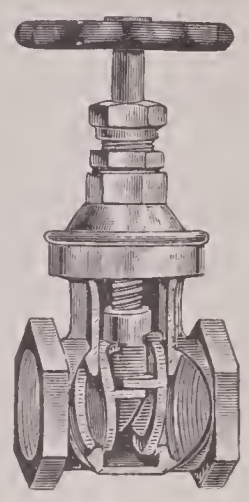

Fig. 5.

wedged against the circular valve-seats by the action of the screw after it has been rotated far enough to bring the plates into position opposite the seats. Fig. 6 is an air-valve for water-pipes, intended to be placed on a line of pipe to allow air to enter when the water is being drawn off, and to permit air to escape when the pipe is being refilled with water. When the pressure is on the pipe and the water enters and fills the chamber, A, it causes the float, C, to rise and close the disk above it against the valve-seat

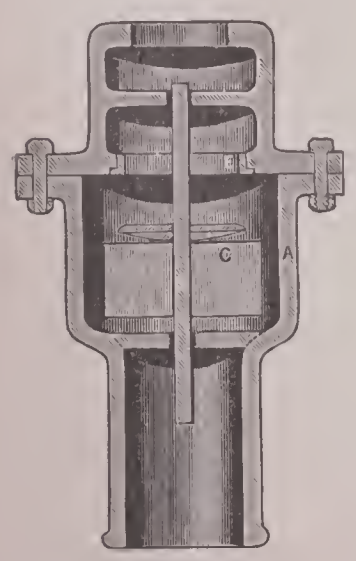

Fig. 6.

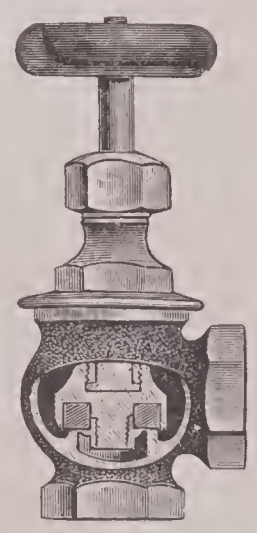

Fig. 7.

at E. One of the most common forms of valve for pipes of all kinds is the globe-valve, Fig. 7, so called from the globular form of its casing. The valve shown in the cut is provided with a renewable disk of soft metal, asbestos, or packing of some kind, shown in dark shading, which makes a tight joint upon the valve-seat. Fig. 8 is known as an angle-valve. It is like the globe-valve, but the entrance and discharge are at right angles.

A common form of valve for pipes is called a cock; this consists of a slightly tapered plug, fitting accurately, and rotating in a similarly tapered casing, placed transversely to the pipe, a hole being cut through opposite sides of the casing in the direction of the flow of the liquid, and a hole of the same size being cut in the plug. When the plug is so turned that its hole is in line with the holes in the casing the cock is open, and when it is placed so as to be at right angles to them the cock is shut. Fig. 9 shows a variety of this cock known as a three-way cock, which allows

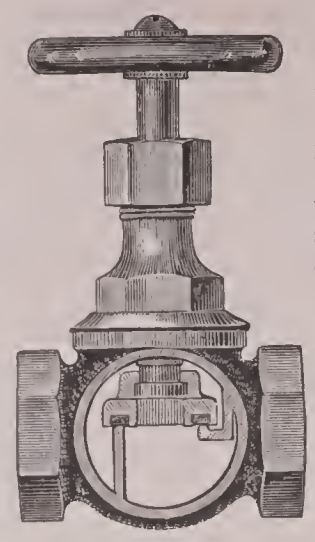

Fig. 8.

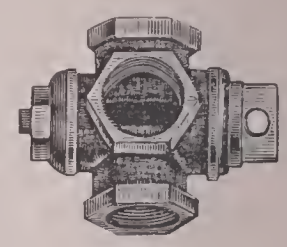

Fig. 9.

the liquid to flow in any one of three different directions, according to the position of the plug. Fig. 10 is a cross-section of a three-way cock. The six shaded portions in the casing are plugs of asbestos packing which prevent leakage. This cock will open and close as follows: From port 1 to port 2, closing port 3; or port 1 to port 3, closing port 2; or port 2 to port 3, closing port 1. It will also close all three ports, and close any port before opening the other. All three ports can never be opened at one time.

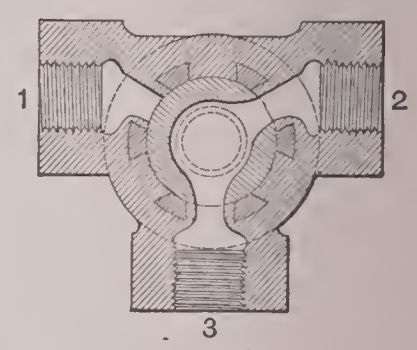

Fig. 10.

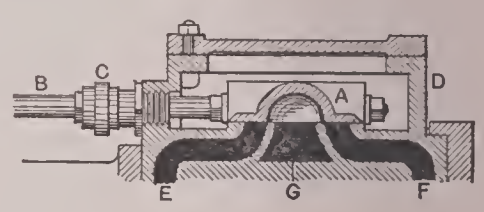

Fig. 11.

The form of valve commonly used in steam-engine cylinders is known as the plain slide-valve, or D-valve, shown in Fig. 11. A is the valve which is moved to and fro on its seat by the valve-rod, B, which passes steam-tight through the stuffing-box, C. D is the steam-chest, E and F the steam-ports, and G the exhaust-port. These ports are cast with the body of the engine cylinder. In its central position, as

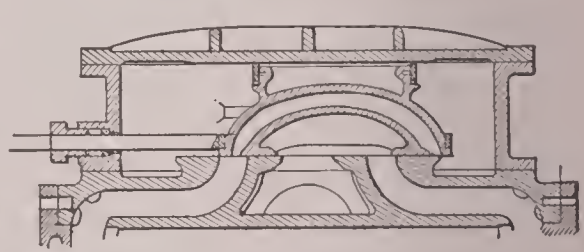

Fig. 12.

shown, the valve covers both steam-ports. If the valve be moved to the left, so that the edge at A uncovers the opening to the port F, the inside edge of the other end of the valve will uncover E and establish a passage through the hollow portion of the valve, from E to G. The steam from the main steam-pipe then entering the steam-chest, D, will pass through the port F into the cylinder, driving the piston to the left, while the exhaust steam from the

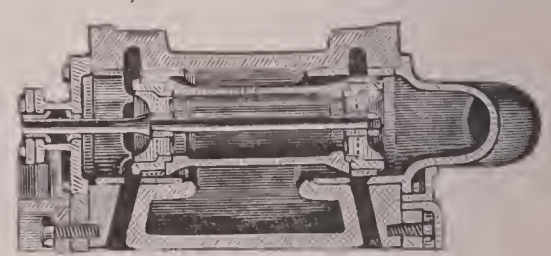

Fig. 13.

other side of the piston will pass through the ports E and G to the exhaust-pipe, not shown, with which G connects.

In order that the opening of the steam-port may be increased without increasing the travel of the valve, the D-valve is sometimes cast hollow, with an open passage through

its back, as shown in Fig. 12. This is known in the U. S. as the Allen valve, and in Great Britain as the Trick-ported valve. It will be observed that while in the position shown in the cut, the valve being supposed to be moving to the right, there is as yet no opening for steam into the left-hand port from the left edge of the valve, but there is already an opening into this port from the other end of the valve through the back passage. The valve shown in Fig. 12 is also a balanced valve —that is, the pressure in the steam-chest, which in the ordinary D-valve holds the valve down on its seat with great pressure, and in large valves is the cause of considerable loss of power by reason of the friction it occasions, is in this valve to a large extent relieved by means of the device shown on the back of the valve, which excludes the steam from the space between the back of the valve and the cover of the steam-chest.

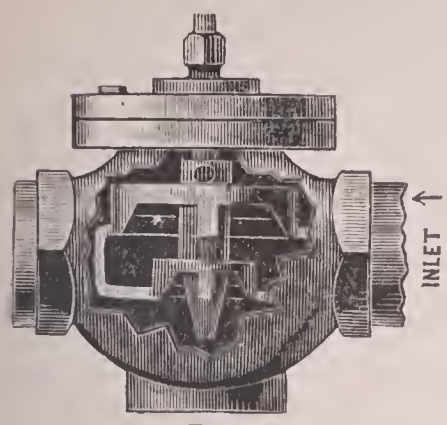

Fig. 14.

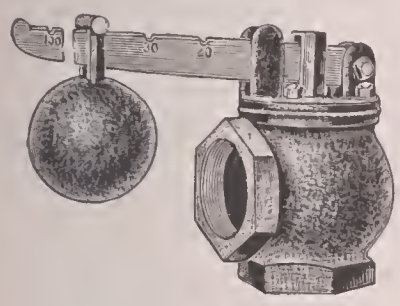
Fig. 15.

Another form of valve which is frequently used for steam-engines, and which is perfectly balanced, is the piston-valve, shown in Fig. 13. It is essentially a slide-valve, but the valve faces and seats being cylindrical, and the ports extending entirely around the casing, the pressure of steam is equalized on all sides.

Fig. 14 is a partially balanced disk-valve. The water or steam enters between the two valves, and the upper one having a greater area than the lower, the pressure of the inflowing fluid will tend to cause the valve to rise. If the two disks were of the same area the valve would be perfectly balanced. In the cut the disks are shown as pistons, which slide past their seats. In steam-engine valves of this general form the valves rest upon their seats, and the valve is then called a "double-beat" valve.

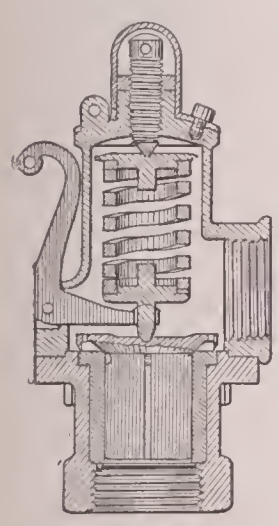
Fig. 16.

Fig. 15 is an external view of the common lever safety-valve. The valve is a disk with a conical edge, resting on a conical seat. The disk is held to its seat by the pressure of a weight acting on a lever, as shown. In the spring-loaded safety-valve, Fig. 16, the pressure of a spring is substituted for the weight and lever. In the particular form of valve shown in the cut, known as the "Pop" safety-valve, the valve has two seats, one of larger area than the other. When the pressure of steam has become sufficiently great to raise the valve when acting only on the smaller area, the valve opens, but immediately the pressure acts on the larger area and keeps the valve open until the pressure is reduced to such a point that acting on the larger area it will no longer overcome the pressure of the spring. For other forms of valve, see PNEUMATICS, PUMP, STEAM-HAMMER, and STEAM-ENGINE. For the valves of the circulation, see HEART and VEINS. WM. KENT.

Vambéry, vaam'bā-rĕē, ARMINIUS (or HERMAN): traveler and Oriental scholar; b. at Szerdahély, near Pressburg, Hungary, Mar. 19, 1832; spent his youth in poverty, but while serving an apprenticeship studied European and Asiatic languages in Pressburg and Vienna; later was private tutor in Slavonia and in Pesth. Linguistically well equipped, he went to Constantinople, where he acquired the Turkish language, and became so thoroughly imbued with the Turkish mode of thought that he was able, with the assistance of the Academy of Pesth, to undertake a journey of exploration into Turkestan, disguised as an Oriental dervish, in 1862. He arrived in Khiva in June, 1863, visited Bokhara and Sarmakand, and returned to Persia by way of Herat. After his return to Europe, Vambéry published an account of his journey, which was the first of the kind ever undertaken by a European, in English and German (Leipzig, 1865; 2d ed. 1873), and was at once called to the chair of Oriental Languages in the University of Pesth. His *Cagataïsche Sprachstudien* (Leipzig, 1867) is the standard work on the Eastern Turkish language. He edited *Kudatku-Bilik*, the Uigurian work, in which the oldest linguistic monument of the Turks is preserved, and wrote *Hungarian-Turkish Word-Comparisons* and an *Etymological Dictionary of the Turco-Tartar Languages* (Leipzig, 1878). His fame rests chiefly upon his geographical, historical, and political works on the Orient: *Travels in Persia* (Leipzig, 1867); *Sketches of Central Asia* (Leipzig, 1868); *History of Bokhara and Transoxania* (Stuttgart, 1872); *Central Asia and the Anglo-Russian Frontier Question* (Leipzig, 1873); *Islam in the Nineteenth Century* (Leipzig, 1875); *Sittenbilder aus dem Morgenlande* (Berlin, 1876); *Primitive Civilization of the Turco-Tartar Peoples* (Leipzig, 1878); *Origin of the Magyars* (Leipzig, 1882); *The Turkish Nation* (Leipzig, 1885); *The Scheïbaniade* (an Usbek epos in 10,000 verses, Budapest, 1885); *Der Zukunftskampf um Indien* (Vienna, 1886); *The Story of Hungary* (in the Story of the Nations Series, New York, 1886). HERMANN SCHOENFELD.

Vampire [= Fr., from Servian *vampir*: Russ. *vampirŭ*]: according to a superstition still existing among the lower classes in Hungary, Servia, Roumania, and the Christian population of the Balkan peninsula, a kind of ghost which during the night leaves the grave and maintains a semblance of life by sucking the warm blood of living men and women. It is probable that this superstition originated from the ancient myth of the *lamiæ*, but it was much strengthened by the belief, common in the Middle Ages all through the Greek Church, that the bodies of those who died under the ban of the Church were kept alive by the devil, and by him sent out to ruin their friends and relatives. Early in the eighteenth century a vampire panic spread over Servia and Hungary, and thence into Germany. Thousands of graves were opened, and corpses which looked suspicious were fastened with nails and bolts to the ground, that they should not wander any more. Among the Wallachs it is still customary to drive a nail through the head of the corpse into the bottom of the coffin.

Vampire Bat: See BAT.

Van (anc. *Semiramocerta*): town; in the vilayet of Van, Asiatic Turkey (see map of Turkey, ref. 5–J). It is 5,200 feet above the level of the sea, on Lake Van, a salt-water lake with an area of 1,550 sq. miles. Above the city rises a vast rock on which are extensive ruins and many cuneiform inscriptions. Carpets and coarse cotton fabrics are manufactured. Pop. 30,000. E. A. G.

Vana'dium [Mod. Lat., from Icel. *Vanadīs*, a surname of the Scandinavian goddess Freya]: a chemical element, a metal discovered in 1801 by the chemist Del Rio in a Mexican lead ore, now called *vanadinite*, and named by him *erythronium*; but erythronium was for twenty-nine years a doubtful element, being imagined by many chemists, including its discoverer, to be identical with chromium. In 1830 Sefström, however, found it again in some commercial bar iron, and called it *vanadium*—a name which still stands. Wöhler first pointed out that Sefström's supposed new element was the erythronium of Del Rio. In 1831 Berzelius described a number of vanadium compounds, and concluded that the metal yielded an acid-forming trioxide like chromium and molybdenum. In 1867 Roscoe discovered that the supposed vanadium of Berzelius was either an oxide or a nitride—a discovery which changed the whole aspect of this element and of its chemical relations, developing the fact that vanadium is closely related to phosphorus and arsenic. Vanadium occurs as an essential constituent of several mineral species, *dechenite* and *descloizite* being vanadates of lead, *vanadinite* being lead vanadate, *volborthite* being a copper vanadate, *psittacinite*, a lead and copper vanadate, etc. At Granite Creek, Eldorado co., Cal., in a gold mine, Dr. James Blake, of San Francisco, found a dark-green mica which he supposed to contain chromium largely, but Dr. Genth showed it to contain vanadium, and this interesting vanadium mica was named *roscoelite*, by Dr. Blake, after the chemist Roscoe. Metallic vanadium was obtained by Roscoe by long-continued ignition of the dichloride VCl_2, in hydrogen gas,

as a metallic powder of a grayish-white color. Its equivalent weight is 51·3. Its density at 15° C. is 5·5. Vanadium forms five oxides, in exact parallelism with those of nitrogen —V_2O, V_2O_2, V_2O_3, V_2O_4, V_2O_5, of which the last is the most important. This, the pentoxide, V_2O_5, forms salts, known as vanadates, which are analogous to the phosphates. Certain vanadium salts yield an intensely permanent black color, hence their application in the manufacture of inks and for dyeing. Revised by IRA REMSEN.

Van Bemmel, EUGÈNE: author; b. at Ghent, Belgium, Apr. 16, 1824; studied at Brussels; attracted much attention by his *Mémoire sur la Langue et la Poésie provençales* (1846); in 1849 was made Professor of French Literature in the University of Brussels. Among his works were *Voyage à travers champs* (1847); *L'Harmonie des Passions humaines* (1855); *Histoire de Saint Josse-ten-Noode* (1869); and the novel *Don Placide: Mémoires du dernier Moine de l'Abbaye de Villers* (1876). D. in Brussels, Aug. 19, 1880. Revised by A. G. CANFIELD.

Van Beneden, PIERRE JOSEPH: zoölogist; b. at Malines, Belgium, Dec. 19, 1801; studied medicine and natural science; was appointed keeper at the museum of natural history at Louvain, and afterward also Professor of Zoölogy in the university. He published *Manuel d'Anatomie comparée* (3 vols., 1852); *Mémoire sur les Vers intestinaux* (1858); *Recherches sur les Hirudinées et les Trématodes marins* (1863); *Recherches sur la Faune littorale de Belgique* (1869); *Ostéographie des Cétacés Vivants et Fossiles* (1868–77), and numerous smaller papers. D. at Louvain, Jan. 8, 1894.—EDOUARD VAN BENEDEN, son of the foregoing, was born at Louvain, Mar. 5, 1846. He became Professor of Zoölogy in the University of Liège and has published numerous papers upon the fertilization of the egg and the development of Tunicates; founded and is editor of *Archives de Biologie*. Revised by J. S. KINGSLEY.

Vanbrugh, văn-broo', Sir JOHN: architect and dramatist; b. probably at Chester, England, in 1666; was of Flemish descent; received a liberal education, partly in France; entered the French army as ensign, and rose to the rank of captain; became in 1695 secretary to the commission for completing Greenwich Hospital; devoted himself to literature and to the profession of an architect; brought out with great success the comedies *The Relapse* (1697), written as a sequel to Cibber's *Love's Last Shift*, and the *Provoked Wife* (1698), which exposed him to the charge of indecency and profanity strongly pressed by Jeremy Collier; wrote, in consequence, his highly moral comedy *Æsop* (1699), partly from the French of Boursault, afterward recast by Garrick; produced an adaptation of Fletcher's *Pilgrim* (1700); made in 1702 the architectural designs for Castle Howard, Yorkshire, the seat of the Earl of Carlisle; became Clarenceieux king-at-arms 1703; undertook, in connection with Congreve and the actor Betterton, the construction of a large theater in the Haymarket (1705), which proved a failure from defective acoustic properties; was for a short time manager of the Haymarket; produced there his *Confederacy* (1705), a witty but highly immoral comedy, and three adaptations from Molière; was the architect of the Palace of Blenheim, built by order of Parliament for the Duke of Marlborough—a task which occupied him for several years (1706–15) and involved him in a quarrel with the duchess; built several edifices of minor importance; was knighted and made comptroller of the royal works 1714, and surveyor of the works at Greenwich Hospital 1716. D. in London, Mar. 26, 1726. His last play, left unfinished, *The Journey to London*, was completed by Colley Cibber under the title *The Provoked Husband*. His comedies, ten in number, are admitted to be well written and to contain life-like pictures of the times. They lack the brilliancy of Congreve's dialogue, but excel in mastery of situation and realistic handling of character and manners; and, except for their coarseness, resemble Molière's plays more closely than do the works of Vanbrugh's English contemporaries. His comedies were edited with a biographical notice by Leigh Hunt, in connection with the plays of Congreve, Wycherley, and Farquhar (London, 1840), a volume which gave occasion to Macaulay's characteristic essay on *The Comic Dramatists of the Restoration*. Revised by H. A. BEERS.

Van Buren: city; capital of Crawford co., Ark.; on the Arkansas river, and the St. L. and San Fran. and the St. L., Iron Mt. and S. railways; 9 miles N. E. of Fort Smith, 145 miles W. of Little Rock (for location, see map of Arkansas, ref. 2–A). It has 2 public schools, several saw and planing mills and cotton-gins, wagon, cigar, and ice-factories, foundry, and fruit-canneries, 2 State banks with combined capital of $200,000, and a daily and 4 weekly newspapers. Pop. (1880) 1,029; (1890) 2,291; (1900) 2,573. EDITOR OF "VENTURE."

Van Buren: town (incorporated in 1881); Aroostook co., Me.; on the St. John river, and the Canadian Pac. Railway; 75 miles N. of Houlton, the county-seat (for location, see map of Maine, ref. 2–F). It is connected by stage lines with Fort Fairfield and Fort Kent, and contains a Roman Catholic church, St. Mary's College, and the Convent of the Good Shepherd. Pop. (1890) 1,168; (1900) 1,878.

Van Buren, MARTIN: the eighth President of the U. S.; b. at Kinderhook, N. Y., Dec. 5, 1782. He began the study of law at the age of fourteen, and took an active part in politics before he had reached the age of twenty; in 1812 was elected to the State Senate; was attorney-general 1815–19, and in 1816 a State Senator for a second time. In 1818 he reorganized the State Democracy, and became a member of a small clique of politicians known as the "Albany regency," which held control of the State for a score of years. In 1821 he was chosen a member of the convention for revising the State constitution, in which he advocated an extension of the franchise, but opposed universal suffrage, and also favored the proposal that colored persons in order to vote should have freehold property to the amount of $250. In this year he was also elected U. S. Senator, and at the conclusion of his term, in 1827, was re-elected, but resigned in the following year, having been chosen Governor of the State. In Mar., 1829, he was appointed by President Jackson Secretary of State, but resigned in Apr., 1831, and during the recess of Congress was appointed minister to England, whither he proceeded in September. The Senate, when convened in December, refused to ratify the appointment, mainly on the ground that Mr. Van Buren, while Secretary of State, had foisted domestic party questions into his foreign diplomacy. In May, 1832, he was nominated as the Democratic candidate for Vice-President, and elected in the following November. In 1836 he was elected President, receiving a majority of the popular vote and 170 electoral votes out of 294, Gen. William Henry Harrison receiving 73. The opening of his administration was at a time of severe financial difficulty, which resulted in the suspension of specie payments by the banks and in the crisis of 1837–39, and the President urged the adoption of the independent treasury system, which was twice passed in the Senate and defeated in the House, but finally became a law near the close of his administration. Another important measure was the passage of a pre-emption law, giving actual settlers the preference in the purchase of public lands. Early in the administration occurred the insurrectionary movement in Canada, which was encouraged and aided by U. S. citizens on the borders. The President issued two proclamations against this violation of treaties, and sent a military force to the frontier to maintain order. The question of slavery began to assume great prominence in national politics, and after an elaborate anti-slavery speech by William Slade, of Vermont, in the House of Representatives, the Southern members withdrew for a separate consultation, at which Robert B. Rhett, of South Carolina, proposed to declare it expedient that the Union should be dissolved; but the matter was tided over by the passage of a resolution that no petitions or papers relating to slavery should be in any way considered or acted upon. In the presidential election of 1840 Mr. Van Buren was nominated without opposition as the Democratic candidate, William H. Harrison being the candidate of the Whig party. The Democrats carried only seven States, and out of 294 electoral votes only 60 were for Mr. Van Buren. The Whig popular majority, however, was not large, the elections in many of the States being very close. In 1844 Mr. Van Buren was proposed as the Democratic candidate for the presidency, and a majority of the delegates to the nominating convention were in his favor, but owing to his opposition to the proposed annexation of Texas he could not secure the requisite vote of two-thirds; his name was at length withdrawn by his friends, and Polk received the nomination, and was elected. In 1848 Lewis Cass was the regular Democratic candidate; a schism, however, sprang up in the party upon the question of the permission of slavery in the newly acquired territory, and a portion of the party, taking the name of "Free-soilers," nominated Van Buren; they drew away sufficient votes to secure the election of Gen. Taylor, the Whig candidate. In

accepting the nomination Van Buren declared his full assent to the anti-slavery principles of the platform. The convention declared that Congress "had no more power to make a slave than to make a king," and that it was the duty of the national Government to relieve itself "of all responsibility for the existence or continuance of slavery wherever the Government possessed constitutional authority to legislate on that subject." After this, Van Buren retired to his estate at Kinderhook, where the remainder of his life was passed, with the exception of a European tour in 1853–54. D. at Kinderhook, July 24, 1862. He left a MS., which was edited and published by his sons, entitled *An Inquiry into the Origin and Course of Political Parties in the United States* (1867). See Von Holst, *Constitutional History of the United States*; the *Life*, by Edward M. Shepard, in the American Statesmen Series (1888); and George Bancroft, *Martin Van Buren to the end of his Public Career* (1889).

Revised by F. M. Colby.

Van Buren, William Holme, M. D., LL. D.: surgeon; b. in New York, Apr. 5, 1819, of a family of famous physicians; educated at Yale College; graduated in medicine at the University of Pennsylvania in 1840; was assistant surgeon U. S. army 1840–44; settled in New York in 1845. On the organization of Bellevue Hospital, in New York, in 1847, he was made one of its surgical staff, in 1849 he became surgeon of St. Vincent's Hospital, and in 1852 he succeeded Granville S. Pattison in the chair of Anatomy in the medical department of the University of the City of New York, which he resigned in 1866 to accept the chair of Surgery in Bellevue Hospital Medical College. His reputation as a surgeon was won in a great measure during his occupancy of these positions. His success in operative surgery gave him a national reputation, which was subsequently enhanced by his contributions to medical literature. Besides his *Contributions to Practical Surgery*, published in 1865, he translated Bernard and Huette's *Operative Surgery* and Morel's *Histology*, and was a frequent contributor to the current medical literature. D. in New York, Mar. 25, 1883.

Revised by S. T. Armstrong.

Vance, Zebulon Baird: U. S. Senator; b. in Buncombe co., N. C., May 13, 1830; educated in Washington College, Tennessee, and in the University of North Carolina; studied law, and was admitted to the bar in 1853; established himself at Asheville, N. C.; and in 1854 was elected to the State Legislature; in 1858 was elected a Representative in Congress, to fill a vacancy occasioned by the resignation of Thomas L. Clingman, and was re-elected in 1859. He was originally opposed to secession, but when the civil war broke out took the side of his State, raised a company of soldiers, and soon after was chosen colonel of the Twenty-sixth North Carolina Regiment. In 1862, while serving in the field, he was elected Governor, and was re-elected in 1864; in 1870 was elected to the U. S. Senate, but was not allowed to take his seat, and resigned in 1872; returned to the practice of law at Charlotte; in 1876 was elected Governor; was elected U. S. Senator in 1879, and re-elected in 1884 and 1890. D. in Washington, D. C., Apr. 14, 1894.

Vanceburg: town; capital of Lewis co., Ky.; on the Ohio river, and the Ches. and Ohio Railway; 20 miles W. of Portsmouth, O. (for location, see map of Kentucky, ref. 2–J). It is in an agricultural, fruit-growing, and lumbering region; contains the Riverside Seminary, a State bank with capital of $25,000, and a weekly newspaper; and is principally engaged in quarrying and the manufacture of flour, feed, hubs, spokes, staves, and leather. Pop. (1880) 1,095; (1890) 1,110; (1900) 1,161.

Editor of "Sun."

Van Cort'landt, Philip: soldier; a descendant of Oloff or Oliver Stevense van Cortlandt (1600–84), one of the most prominent of the early settlers of New Netherlands; b. at Cortlandt manor, Westchester co., N. Y., Sept. 1, 1749; became a land surveyor, and at the opening of the war of the Revolution was made lieutenant-colonel, and in 1776 colonel. He served in the battle of Stillwater, and against the Indians on the frontier in 1778; commanded a regiment under La Fayette, and was made brigadier-general for gallant conduct at the siege of Yorktown. He was a member of the court that tried Gen. Arnold for improper conduct at Philadelphia, and was in favor of cashiering him. Van Cortlandt was a member of the New York Assembly in 1788–90, of the State convention of 1788 by which the Constitution of the U. S. was adopted, State Senator 1791–94, and Representative in Congress 1793–1809. He was appointed to accompany La Fayette in his tour through the U. S. in 1824. The latter part of his life was spent at his manor in Westchester co., N. Y., where he died Nov. 5, 1831. Revised by F. M. Colby.

Vancou'ver: city; New Westminster district, British Columbia, Canada; on Burrard Inlet, and the Canadian Pacific Railway; 12 miles N. of New Westminster, and about 85 miles N. by E. of Victoria, the capital of the province (for location, see map of Canada, ref. 8–D). It is the largest city on the mainland of British Columbia, is a seaport of the province, and is connected with New Westminster by electric railway and with Victoria by mail-steamers. The city is laid out on the U. S. block system, with wide streets lighted by electricity and paved with bituminous rock. Stanley Park, at the entrance to the harbor, has a beautiful location on a promontory, with an excellent 8-mile driveway along the water's edge. There are 4 Church of England, 4 Presbyterian, 3 Methodist, 2 Baptist, 2 Congregational, and Roman Catholic churches, Salvation Army barracks, and a branch of the Y. M. C. A.; 4 public schools, City Hospital, Roman Catholic Hospital, St. Luke's Home, several orphanages, 4 chartered banks, and a semi-monthly, a monthly, 2 daily and 2 weekly periodicals. In 1894 the city had a ratable property valuation of $18,301,184; revenue, $484,781; expenditure, $406,008; and debt, $1,926,451. Of the principal buildings, the post-office, the Bank of Montreal, and the Bank of British North America are built of stone from a quarry a few miles distant. The city is the west terminus of the railway, and has regular mail-steamer communication with China, Japan, and Australia. It has large and varied lumber interests, railway construction and repair shops, foundry and iron-works, sugar-refinery, and pork-packing works. Vancouver was laid out, totally destroyed by fire, and rebuilt in 1886, and has an area of more than 15 sq. miles. Pop. (1891) 13,685; (1895) estimated, 18,000.

Arthur P. Judge.

Vancouver: city; capital of Clarke co., Wash.; on the Columbia river; 6 miles above the mouth of the Willamette river, and 6 miles N. of Portland, Ore. (for location, see map of Washington, ref. 7–C). It is one of the oldest cities in the Northwest, having been founded by the Hudson Bay Company in 1828. Fort Vancouver, the headquarters of the department of the Columbia, and one of the finest military stations W. of the Mississippi, is located here. The city contains St. James's College (Roman Catholic, opened in 1856, chartered in 1887), a national bank with capital of $100,000, a State bank with capital of $50,000, and four weekly newspapers, and is principally engaged in lumbering, dairying, and fruit-growing. Pop. (1880) 1,722; (1890) 3,545; (1900) 4,006.

Editor of "Columbian."

Vancouver Island: an island in the Pacific Ocean, named after the navigator George Vancouver (1758–98). It forms part of the province of British Columbia, being separated from the mainland by Queen Charlotte Sound, Johnstone Sound, and the Strait of Georgia, and lies between lat. 48° 20′ and 50° 53′ N., and lon. 123° 17′ and 128° 28′ W. Area between 15,000 and 16,000 sq. miles. Throughout the length of the island there extends a ridge of bare and rocky mountains averaging 3,000 feet in height, rising in its highest peak, Mt. Arrowsmith, to 5,900 feet. The coasts of the island, especially the west, are much indented with narrow fiords, marked by steep rocky cliffs and promontories interspersed with strips of pebbly beaches and sheltered nooks with fine harbors, notably those of Esquimalt, San Juan, Alberni Canal, Hesquiot, Pachena, and Quatsino. The northern and southern extremities of the island are comparatively flat, and the most settled portions are in the south, where Victoria is, and around the coal regions of Nanaimo on the east coast. There are no navigable rivers, and the streams, which are mountain torrents in winter and nearly dry in summer, run very short and rapid courses.

The climate in many respects resembles that of Great Britain, being modified by the arctic currents that flow down along the coasts. The winter is generally open, mild, and wet; the spring is later, and the summer hotter and drier than in England. The average maximum temperature is about 83° and the minimum 22° F. The larger portion of the island is unsuited for agriculture, being little better than bare rock. The most general crops are wheat, oats, barley, and all sorts of vegetables. Fruit-culture is also being developed successfully. The principal mountain range has been found to contain in many places gold, silver, iron, copper, lead, and other metals. In the vicinity of Alberni gold-bearing quartz-ledges contain gold in paying quantities. Marble of a very fine quality has been discovered. Coal

is abundant, especially around the town of Nanaimo and to the N. of it. The panther, bear, and wolf are found in the forests; two kinds of deer, grouse, quail, pheasants, and other wild fowl abound, and the many lakes are full of fish. Extensive banks lie off the southwest coast well stocked with cod, halibut, whiting, sturgeon, and herring, and deep-sea fishing is becoming one of the main industries of the island, together with the lumber industries, ship-building, and coal-mining. The population in 1891 was 37,000. The capital is VICTORIA (*q. v.*). The island was discovered in 1592 by Juan de Fuca, was visited in 1792 by Capt. Vancouver, and was ceded to Great Britain by treaty with the U. S. in 1846. In 1848 it was leased to the Hudson Bay Company by the crown for ten years, and was an independent crown colony till 1866, when it was united with the mainland of British Columbia as the colony of British Columbia. It sends fourteen members to the Provincial Legislature.

J. STUART YATES.

Vanda'lia: city; capital of Fayette co., Ill.; on the Kaskaskia river, and the Ill. Cent. and the Vandalia Line railways; 62 miles S. by W. of Decatur, 68 miles E. N. E. of St. Louis, Mo. (for location, see map of Illinois, ref. 8–E). It is in a hard-wood timber region; was formerly the capital of the State, and has 6 churches, 2 public-school buildings, a State bank with capital of $100,000, a private bank, three weekly newspapers, and manufactories of brick-making machines, paper, flour, woolen goods, plows, carriages and wagons, and chairs. Pop. (1880) 2,056; (1890) 2,144; (1900) 2,665.

EDITOR OF "LEADER."

Vandals: an ancient pure Germanic race belonging to the large group of Gothic tribes. The theory of their Sarmatian origin and Šafařik's opinion that they were a Slavo-German-Celtic race have been conclusively refuted. They were divided into the Asdingian and Silingian sections, and occupied in the second century the upper Oder, the Riesengebirge (*Montes Vandalici*), and the Sudeten, approximately the present province of Silesia (which derived its name from the Silingi). During the Marcomannic wars with Marcus Aurelius (161–180 A. D.) the Asdingi were allies of the Quadi and Marcomanni in Dacia, while the Silingi migrated westward about 280, and located on the Middle Main. The former were partly destroyed by the Gothic king Geberic(h) in a battle on the Maros river, where their king, Wisumar, was slain; the remnants were permitted by Constantine the Great to settle in Pannonia about 334. Allied with the Suevi and Alani, and reunited with the Silingi, they suddenly invaded Gaul in 406, under their king, Godigisel (Γοδιγίσκλος), and under his son Gunderic(h) they crossed the passes of the Pyrenees into Spain in 409. After severe wars against the Visigoth king Wallia (415–418), and a victory over the Roman *magister militum* Castinus (422), the Vandals founded in the southern part of the country (ancient Bætica), an independent kingdom, *Vandalitia*, now Andalusia. Gunderic was succeeded by his illegitimate brother Genseric or Geiseric in 427. Two years later Bonifacius, governor of the Roman province of Africa, slighted by the emperor's mother, Placidia, the imperial regent in Ravenna, called the Vandals to Africa. Genseric crossed the Strait of Gibraltar with about 80,000 persons, of whom 50,000 were warriors. Meanwhile Bonifacius, through the good services of St. Augustine, had become reconciled to the Emperor Valentinian III., and ordered the Vandals out of the country. But Genseric, an Arian Christian, aided by the Arian Donatists and the Barbary tribes, defeated Bonifacius and conquered the whole of the northern coast of Africa as far as Tunis, broke the peace concluded with the Romans in 434, and five years later took Carthage and made it the capital of the Vandal kingdom. He developed a powerful fleet, with which he conquered the Baleares, Corsica, Sardinia, and Western Sicily, invaded Italy, and in 455 he captured and sacked Rome, and carried away nearly all its movable wealth to Carthage. Genseric held out against both the Western and Eastern Roman emperors, but died in 477. The Vandal kingdom began to decline, under his successors, Hunneric (477–484), Guntamund (484–496), and Thrasamund (496–523), all of whom exasperated their orthodox Roman subjects by bloody persecutions, while Hilderic (523–530), by favoring the Romans and the orthodox Church, alienated his Vandal subjects, and was dethroned by Gelimer, his uncle. The Byzantine emperor Justinian I. sent an army to Africa under Belisarius, who defeated Gelimer at Tricamarum, about 20 miles from Carthage, Dec., 533, and carried him to Constantinople to adorn his triumph. Most of the surviving Vandal warriors were drafted into the imperial army and disappeared in the wars against Persia, while others were absorbed in Africa by the Roman and Berber natives. See, further, Procopius, *De Bello Vandalico*; Papencordt, *Geschichte der Vandalischen Herrschaft in Africa* (Berlin, 1837); Felix Dahn, *Könige der Germanen, I.*, with excellent bibliography (Munich and Würzburg, 1861); Th. Hodgkin, *Italy and her Invaders* (vols. ii. and iii.).

HERMANN SCHOENFELD.

Vandamme, vaăn'daam', DOMINIQUE JOSEPH, Count of Huningen: b. at Cassel, department of Nord, France, Nov. 5, 1771; entered the French army in 1788, and served in a regiment in Martinique, but returned in 1790, and organized in 1792 a volunteer regiment, the so-called *chasseurs du Mont-Cassel*, at the head of which he distinguished himself so greatly that in 1793 he was made a brigadier-general. In 1799 he was made a general of division, fought with great distinction at Austerlitz and Eckmühl, and was made a count, but took no part in the Russian campaign of 1812 on account of a conflict with Jerome. In 1813 he commanded the corps which from Lower Saxony was destined to penetrate into Bohemia in pursuit of the allied army, which had been defeated at Dresden, Aug. 27, but at Kulm he was surrounded, defeated, and compelled to surrender with 10,000 men and eighty-one guns, Aug. 30. He was taken as a prisoner to Russia, but restored to liberty in 1814. During the Hundred Days he joined Napoleon, fought at Ligny and Waterloo, and led the army back to the walls of Paris. During the second Restoration he was banished from France, lived for a time in the U. S., returned to France in 1824, and died in Cassel, July 15, 1830. See Du Casse, *Le général Vandamme et sa correspondance* (Paris, 1870).

Revised by F. M. COLBY.

Van den Eeckhout: See EECKHOUT, GERBRAND VAN DEN.

Vanderbilt, CORNELIUS: financier and capitalist, called Commodore; b. near Stapleton, Staten Island, N. Y., May 27, 1794, the son of a farmer. He early learned to manage a sail-boat, and at the age of sixteen purchased one for himself, with which he carried passengers and produce between New York and Staten Island. He invested his profits in similar enterprises, and soon had interests in many boats, schooners, and sloops engaged in transportation in the vicinity of New York. In 1817 he became captain of a steamer that ran between New York and New Brunswick, N. J., and in 1827 leased a ferry that ran to Elizabeth, N. J. Later he became interested in lines that ran up the Hudson, and also in lines to various points on Long Island Sound. Soon after the discovery of gold in California he put into operation a line of steamers that made rapid time by transferring its passengers across the Isthmus of Nicaragua, and in this enterprise he accumulated a fortune of $10,000,000. When British vessels were withdrawn from ocean traffic on account of the Crimean war, he established a line to Havre, France, but he soon began to dispose of his shipping interests to invest in railways. In 1863 he purchased a large portion of the stock of the New York and Harlem Railroad, and later secured the Hudson River Railroad, after which the New York Central passed into his control, and he became its president in 1867. Under his management the efficiency of these railways was greatly increased and the service improved. In 1869 he effected the consolidation of the New York Central and the Hudson River lines, and later, by purchasing an interest in the Lake Shore, the Canada Southern, and Michigan Central, extended his system to Chicago. He contributed $1,000,000 to found Vanderbilt University, and gave $50,000 to establish the Church of the Strangers in New York; also in 1863 he presented his finest steamship, the Vanderbilt, to the U. S. Government, for which Congress voted him a gold medal. His fortune was estimated at $100,000,000. D. in New York, Jan. 4, 1877. The bulk of his fortune was left to his son WILLIAM HENRY (b. in New Brunswick, N. J., May 8, 1821), who as a boy and as a young man was compelled to make his own way, owing to an unbelief in his abilities by his father. Later he was given the receivership of the Staten Island Railroad, which he conducted with such skill that he was placed in charge of the business management of the railway ventures that the elder Vanderbilt became interested in. In 1864 he was made a vice-president of the Hudson River Railroad, and later of the New York Central. On the death of his father he became president of these railways, and also of the Lake Shore and the Michigan Central, all of which offices he resigned on May 4, 1883. Meanwhile, in various ways he had secured control of the Chicago and Northwestern, and of the Cleveland, Columbus, Cincinnati and Indianapolis Railroad, by means of which he secured a

connection with St. Louis, also of the New York, Chicago and St. Louis (the Nickel Plate) and the West Shore, two roads built to compete with the New York Central system. Besides many other generous gifts, Mr. Vanderbilt gave $200,000 to Vanderbilt University; paid the expenses of the removal of the obelisk from Egypt to Central Park, New York; and gave $500,000 for the erection of the buildings of the College of Physicians and Surgeons. D. in New York, Dec. 8, 1885. The great fortune that he inherited was largely increased, and after leaving $10,000,000 to each of his eight children, and $1,000,000 to charity, the remainder was left to the management of his two elder sons, CORNELIUS (b. Nov. 27, 1843; d. Sept. 12, 1899) and WILLIAM KISSAM (b. Dec. 12, 1849). The former succeeded him in the presidency of the New York Central and the latter in the same office in the Lake Shore Railway. Both contributed largely to various philanthropic purposes, and with the two younger brothers, FREDERICK WILLIAM and GEORGE WASHINGTON, contributed in 1895 $200,000 for the enlargement of the Vanderbilt Clinic in memory of their father, as well as $150,000 for the enlargement of the building of the College of Physicians and Surgeons. Their residences in New York and Newport are noted for their architectural beauty. The country residence, Biltmore, of George W. Vanderbilt, near Asheville, N. C., is the finest country-seat of a private citizen in the U. S. Rosa Bonheur's *Horse Fair* was a gift, among others, to the Metropolitan Museum of Art, by Cornelius Vanderbilt.—CORNELIUS, son of Cornelius (b. in New York city in 1874, graduated at Yale in 1895), has attracted much attention with his engineering inventions. MARCUS BENJAMIN.

Vanderbilt University: an institution of learning at Nashville, Tenn.; in part the outgrowth of a general movement for higher education throughout the Methodist Episcopal Church South. In response to special calls a convention met in Memphis, Jan. 24, 1872, composed of delegates from Tennessee, Alabama, Mississippi, Louisiana, and Arkansas. A general plan for a university was adopted, a board of trust nominated, and shortly afterward a charter secured, under the title of the Central University of the Methodist Episcopal Church South. The efforts to raise the necessary funds met with little success, and the enterprise seemed doomed to failure, when the elder Cornelius Vanderbilt, of New York, made through Bishop McTyeire an offer of $500,000. In recognition of this handsome gift, the name was changed to Vanderbilt University. Mr. Vanderbilt afterward increased his donation to $1,000,000; his son, William H. Vanderbilt, made donations at various times aggregating $450,000, and Cornelius Vanderbilt, a grandson of the founder, made a donation of $30,000. The university is organized in seven distinct departments—academic, biblical, law, medical, pharmaceutical, dental, engineering. The chancellor is James H. Kirkland, Ph. D., LL. D. Each department has its faculty of instruction, charged with its special management. The board of trust is self-perpetuating and consists of thirty-one members. The bishops of the Methodist Episcopal Church South, and the chancellor of the university are, *ex officio*, members of the board. The other members are elected for a term of eight years. The first president of the board was Bishop Holland N. McTyeire, whose guiding hand was felt in every detail of the university life until his death on Feb. 15, 1889. The growth of the university has been constant and rapid. The attendance in 1900 was 777, and the faculty numbered 90. J. H. KIRKLAND.

Van der Goes, vaăn'dĕr-*k*hoos', HUGO: painter; a disciple of Van Eyck; b. at Ghent, Belgium, probably about 1405; painted mostly religious subjects, and is said to have ended his life as a monk in the monastery of Rodendale, near Brussels. His most celebrated pictures are a *Birth of Christ*, in the Church of Santa Maria Nuova, Florence; a *Crucifixion*, in the Church of St. James, Bruges; and a *St. John*, in the Pinakothek of Munich, bearing his name and the date 1472.

Van der Heyden or **Heijden**, -hī'*d*en, JAN: painter; b. at Gorkum, Holland, in 1637; lived mostly in Amsterdam; acquired great fame as a painter of landscapes and city prospects, and received a pension from the Government for his improvements of street-lamps and fire-engines. D. in Amsterdam, Sept. 28, 1712. His principal pictures are of architectural subjects—views in cities such as Amsterdam. There are pictures by him in most of the great galleries of Europe. The figures in his landscapes were often painted by Adrian Vandervelde.

Van der Hoeven, -hoo'*v*en, JAN: naturalist; b. in Rotterdam, Holland, Feb. 9, 1801; studied medicine and the natural sciences at the University of Leyden, and practiced medicine at Rotterdam; in 1826 became Professor Extraordinary and nine years later Ordinary Professor of Zoölogy at the University of Leyden, and in 1858 was appointed director of the Royal Museum of Natural History. His published papers, mostly on zoölogy, are numerous; his best-known work is the manual of zoölogy, *Handboek der Dierkunde* (Leyden, 1827–33; entirely remodeled in 1846), which was translated into several languages. Other important papers are *Mémoire sur le genre Ornithorhinque* (*Isis*, 1821, vi., p. 634); *Tabula Regni Animalis, additis Classium Ordinumque characteribus* (Leyden, 1828); *Contributions to the Knowledge of the Animal Nautilus pompilius* (*Transactions* of the Zoölogical Society, London, 1851, vol. iv., 1). Besides these may be mentioned various papers on insects, on *Sieboldia maxima*, *Limulus*, and *Lepidosteus*. D. at Leyden, Mar. 10, 1868. F. A. LUCAS.

Van'derlyn, JOHN: painter; b. at Kingston, Ulster co., N. Y., Oct. 15, 1776; attracted the attention of Aaron Burr, who invited him to New York and received him into his house. He received instruction from Stuart, and in 1796 went to Europe through the assistance of Burr, where he remained five years. He came back to the U. S. in 1801, but returned to Europe in 1803, remaining until 1815; made many admirable copies from the old masters; painted the picture of *Marius seated amid the Ruins of Carthage*, which gained the Louvre gold medal in 1808, *The Murder of Jane McCrea by the Indians*, and other original works, which gave him a high reputation. Returning to the U. S., he painted the portraits of Calhoun, Clinton, Madison, Monroe, Jackson, and other distinguished men. In 1832 he was commissioned to paint a full-length portrait of Washington for the hall of the House of Representatives, and in 1839 was commissioned to paint the *Landing of Columbus* for the Rotunda of the Capitol. The later years of Vanderlyn's life were passed in poverty. D. at Kingston, N. Y., Sept. 23, 1852. Revised by RUSSELL STURGIS.

Van der Meer, JAN, the elder: painter; b. at Haarlem, Holland, about 1625 or 1628; painted landscapes with animals and sea-pieces, and held various positions in the civil service. D. in Haarlem about 1685.—His son, JAN VAN DER MEER, the younger, b. at Haarlem about 1660, received instruction first from his father, afterward from Berghem, and acquired a great reputation as a painter of landscapes and marine battles. His best picture is a *View of the Rhine*. D. at Haarlem about 1704. His paintings and his father's are very rare outside of the Netherlands.

Van der Meulen, -mō'*l*en, ANTOINE FRANÇOIS: painter; b. in Brussels, Belgium, 1634; received his first instruction in painting from Peter Snayers; was invited to France by Colbert through the influence of Lebrun, and appointed designer at the Gobelins manufactures; attracted attention by his talent for battle-pieces, and accompanied Louis XIV. in several campaigns; was elected a member of the Academy in 1673. Among his most celebrated pictures are the *Entrance of Louis XIV. into Arras* and the *Siege of Maastricht*. D. in Paris, Oct. 15, 1690.

Van der Stucken, FRANK; composer and conductor; b. at Fredericksburg, Tex., Oct. 15, 1858; studied in Antwerp under Benoit and in Leipzig. After completing his studies he made an artistic tour of Europe and returned to the U. S. in 1883, becoming the leader of the Arion Society of New York, and in 1887 leader of the Arion of Newark. These places he resigned in 1895 to become leader of the orchestra in Cincinnati. He has frequently conducted concerts and festivals, and has composed many excellent works, vocal and instrumental, which have been successfully performed both at home and in Europe. D. E. H.

Vandervelde, more strictly **Van de Velde**, WILLEM, the Elder: painter; b. at Leyden, Holland, in 1610; was educated as a sailor, but early attracted great attention by his drawings of sea-views; was sent by the Dutch Government to accompany Admiral de Ruyter, and acquired great reputation by his sketches of manœuvers, engagements, etc.; was invited to England in 1675 by Charles II., who made him court painter of sea-fights and gave him a pension of £100 a year. D. in London in 1693.—WILLEM VANDERVELDE, the Younger, b. in Amsterdam in 1633, succeeded his father as marine painter to the King of England, and attained great fame. Many of his pictures are in England; the gallery at

Bridgewater House is rich in them. D. in London, Apr. 6, 1707. The works of the two painters are confused.

Vandewater, George Roe: See the Appendix.

Van Diemen's Land: a former name for Tasmania (*q. v.*).

Van Dorn, Earl: soldier; b. near Port Gibson, Miss., Sept. 17, 1820; graduated at the U. S. Military Academy in 1842; promoted first lieutenant in 1847; served in the Mexican war, and was breveted as captain and major for gallant conduct at Cerro Gordo, Contreras, and Chapultepec, and was wounded in the final assault upon the city of Mexico; was secretary of the military asylum at Pascagoula, Miss., 1853–55, was subsequently employed in scouting in Texas, led an expedition against the Comanches in 1858, and was severely wounded at Washita Village, Ind. Ter., Oct. 1, 1858; promoted major June, 1860. In Jan., 1861, he entered the Confederate army as colonel, taking command of a regiment of Texan volunteers; early in 1861 he captured the steamer Star of the West at Indianola, and received the surrender of Maj. Sibley and of Col. Reeve, with thirteen companies of U. S. infantry. He became major-general, and in Jan., 1862, was in command of the Trans-Mississippi district; was defeated at Pea Ridge; was transferred to the army of the Mississippi, and was defeated at the battle of Corinth. D. at Spring Hill, Tenn., May 8, 1863.

Van Dyck, Cornelius Van Alen: See the Appendix.

Van Dyck, Ernst: See the Appendix.

Vandyke, Sir Anthony, originally Anthon or Anthonie van Dyck: painter; b. in Antwerp, Belgium, Mar. 22, 1599. He was apprenticed as a boy to Henry van Balen, but by the time he was twenty he had become a pupil of Rubens, and later his assistant. As early as 1620 his name appears as an artist of reputation on his own account, as well as the leading assistant of Rubens. In that year he made a short visit to England. In 1623 and later he traveled in Italy, and seems to have been especially attracted by the Venetian school. His style in the early part of his short career, though evidently founded on the work of Rubens, is yet modified by his study of the Venetian pictures, in that he gives to his figures a dignity and a certain grace of outline and pose which Rubens hardly reaches. About 1627 Vandyke returned to Antwerp, and until 1632 he seems to have made that city or The Hague his place of residence, although it is probable that he went to England at least once during that time. There was abundant employment for him in the Netherlands. Rubens, indeed, was the recognized chief of all painters in the north of Europe; but there was room for others as well, and there must have been many persons ready to prefer the somewhat reserved and quiescent dignity of Vandyke's design to the more energetic and headlong composition of Rubens. In 1632 Vandyke settled in England. He received a pension, the title of painter-in-ordinary to the king, and knighthood, all so soon after his arrival in England that it seems as if promises had been made to him in advance. In 1636 he married Lady Mary Ruthven, a granddaughter of the Earl of Gowrie, and although his employment in England was mainly upon portraiture, that was probably not because of any supposed deficiency in the artist, but because in England at this time, as later, there was little demand for any other kind of painting. Twice, at least, he went to the Continent in search of important decorative work, but failed to receive the commission sought for. Toward the close of 1641 he again went to the Continent and was at work in Paris when his health gave way entirely; he returned at once to England, and died in London, Dec. 9, 1641.

The great number of large and very elaborate portraits by Vandyke, so designed and arranged that they are to be classified with the ideal works of most painters, has caused his religious and miscellaneous pictures to be somewhat overlooked. There are in the Louvre a splendid *Virgin and Child, with Portraits of the Donors*, a *Dead Christ mourned by the Virgin*, and a *Martyrdom of St. Sebastian*; and besides these the famous *Portrait of Charles I.*, with his page and horse in the background, the portrait group of the *Children of Charles I.*, the *Equestrian Portrait of the Marquis of Moncada*, and eight or ten other portraits. The pictures in this one gallery give a fair idea of the range of Vandyke's art, for the portrait of King Charles and that of his children are each of them worked up from the mere acquirements of portrait art to very stately compositions indeed, while, on the other hand, the *Virgin and Child* named above contains the life-size portraits of the two donors, carefully painted and put in the foreground, while the Virgin and Child are treated with a freedom of design which suggests the practiced portraitist. In the National Gallery of London is a splendid picture called *The Portrait of Rubens*, which is known to have belonged to Sir Joshua Reynolds, and to have been much admired by him; also an *Equestrian Portrait of Charles I.*, bought from the Duke of Marlborough for £17,000, an historical picture called the *Emperor Theodosius and St. Ambrose*, and several single portraits. At The Hague is a particularly fine *Portrait of a Painter*. In Antwerp, in the Museum, is a large *Crucifixion* and a *Descent from the Cross* of great merit, and in the Church of St. Jacques another and still finer *Crucifixion*. Still another *Crucifixion* is in the Cathedral of Mechlin. In the Dresden Gallery is a large *St. Jerome*, a *Danaë*, and a number of portraits, among which is a large one of *Charles I. of England*, dated 1637. These are but a few of the very large number of good Vandykes which are distributed through the collections of Europe. In the Metropolitan Museum of New York there are two portraits of great value. Vandyke made a number of etched portraits of artists of his time. Of most of these he engraved the head only, and the prints taken from the plates before the dress, etc., were added by Houbraken or others are considered very valuable. Russell Sturgis.

Van Dyke, Henry, D. D.: clergyman and author: b. at Germantown, Pa., Nov. 10, 1852, son of Rev. Henry J. Van Dyke; educated at Brooklyn Polytechnic Institute, Princeton College and Seminary, and University of Berlin; pastor of the United Congregational church, Newport, R. I., 1879–82; in 1882–99 of the Brick Presbyterian church, New York; preacher at Harvard University 1890–92; and Lyman Beecher lecturer at Yale Seminary 1895–96; professor at Princeton since 1899. He has published *The Reality of Religion* (1884); *The Story of the Psalms* (1887); *The National Sin of Literary Piracy* (1888); *The Poetry of Tennyson* (1889; 5th rev. ed. 1894); *God and Little Children* (1890); *Straight Sermons: To Young Men and Other Human Beings* (1893); *The Bible as It is* (1893); *The Christ Child in Art: A Study of Interpretation* (1894); *The People Responsible for the Character of their Rulers* (1895); *Responsive Readings* (1895); *Little Rivers* (1897); *Fisherman's Luck* (1899); and two volumes of poems.

C. K. Hoyt.

Van Dyke, Henry Jackson, D. D.: minister; b. at Abingdon, Pa., Mar. 2, 1822; educated at the University of Pennsylvania and Princeton Seminary; pastor of the Presbyterian churches—First, Bridgeton, N. J., 1845–52; Germantown, Pa., 1852–53; Second, Brooklyn, N. Y., 1853–91; moderator of the General Assembly at Brooklyn 1876. D. in Brooklyn, May 25, 1891. *A Memorial Volume* was published by Randolph (1892). Dr. Van Dyke published *The Lord's Prayer* (New York) and *The Church: Her Ministry and Sacraments*, Stone lectures (New York, 1890). C. K. Hoyt.

Van Dyke, John Charles, L. H. D.: art critic; b. at New Brunswick, N. J., Apr. 21, 1856; studied in Columbia College and in art centers of Europe; admitted to the New York bar in 1877: has been librarian of Sage Library, New Brunswick, since 1878; is Professor of the History of Art in Rutgers College; has been university lecturer at Princeton, Harvard, Columbia, and other institutions. Prof. Van Dyke has written for several New York dailies and art reviews, is editor of the series *College Histories of Art*, and has published *Books and How to Use them* (New York, 1883); *Principles of Art* (New York, 1887); *How to Judge a Picture* (New York, 1888); *Serious Art in America* (New York, 1889); *Art for Art's Sake* (New York, 1893); *History of Painting* (New York, 1894); and *Dutch and Flemish Masters* (1895).

Vane, Charles William Stewart: See Londonderry, Marquis of.

Vane, Sir Henry: statesman; b. at Hadlow, Kent, England, in 1612, son of Sir Henry (1589–1654), who was Secretary of State to Charles I.; educated at Westminster School, and entered as gentleman commoner Magdalen College, Oxford, about 1628, but before matriculation renounced the Church of England and refused to take the oath of allegiance; traveled in France and Holland, and completed his education at Geneva, where he became a Puritan and a republican; went to Massachusetts Bay in 1635; was chosen governor for the year 1636, but, having favored religious toleration and taken the part of Anne Hutchinson, lost much of his popularity, and was not re-elected; returned to England in

Aug., 1637; was knighted, elected to Parliament, and made joint-treasurer of the navy 1640; took part in the impeachment of Strafford; became sole treasurer of the navy 1642; was a zealous supporter of Parliament in the civil war; gave up to that body the fees of his office, at that time very lucrative, and was influential in securing the adoption of the "Solemn League and Covenant"; enabled Roger Williams to obtain the Rhode Island charter 1643; was a promoter of the "Self-denying Ordinance" 1644; served during the war on important parliamentary commissions; opposed the terms of settlement offered by Charles in 1648; was a member of the Westminster Assembly and a leader of the Independents in Parliament, but opposed Cromwell's arbitrary course; and after the forcible dissolution of the Rump Parliament in 1653 retired to his estate of Raby Castle, where he wrote religious treatises and political pamphlets, one of which led to an imprisonment of four months in Carisbrooke Castle by order of Cromwell Mar., 1656; remained in opposition until the death of the Protector, when he was chosen to Parliament; became the leader of the republican party, and endeavored without success to mould the Commonwealth to his ideas of government; was one of the twenty persons excepted from the act of general pardon and oblivion passed at the Restoration; was sent to the Tower, and afterward to other prisons, remaining two years in a castle in the Scilly islands, occupied in theological studies and writing; was tried for high treason before the court of king's bench June 2, 1662; was unjustly convicted and sentenced to be hanged, and, in violation of a promise made by Charles, was beheaded on Tower Hill, June 14, 1662. His theological writings are pitched in so high a strain of mysticism as to be almost unintelligible to ordinary readers, but are said by Sir James Mackintosh to "display astonishing powers"; and the same writer ranks Vane as "one of the most profound minds that ever existed—not inferior, perhaps to Bacon." His religious views were millenarian, and gave rise to a small circle of disciples known as Vanists. His *Life* has been written by George Sikes (1662); Charles W. Upham, in Sparks's series of biographies (1st series, vol. iv.); John Forster (in *Statesmen of the Commonwealth*, 1840); and James K. Hosmer (1888).

Revised by F. M. Colby.

Van Eyck: See Eyck, John or Jan, van.

Van Helmont: See Helmont, Jan Baptista, van.

Van Hise, Charles Richard: See the Appendix.

Van Horne, Sir William C.: See the Appendix.

Vanilla [= Mod. Lat., from Span. *vainilla*, vanilla bean or pod, vanilla, liter., dimin. of *vaina*, sheath, pod: Fr. *gaîne* < Lat. *vagi'na*, sheath]: the fruit of the *Vanilla planifolia* and of the *Vanilla aromatica*, climbing orchidaceous plants (tribe *Neottieæ*), natives of Mexico and Brazil. *V. planifolia* is cultivated in several tropical countries. The pods are from 6 to 12 inches in length, contain many minute black seeds, possess a very pleasant odor, and are often incrusted with needle-shaped crystals of *vanillin*, their aromatic constituent. They also contain an iron-greening tannin, a fatty oil, and a resin. *Vanillin* ($C_8H_8O_3$), the odorous principle of vanilla, was first considered identical with benzoic and then with cinnamic acid. Its individuality was recognized by Bley in 1858 and by Stokkebye in 1864, who assigned to it the incorrect name *vanillic acid* and the composition $C_{17}H_{22}O_{16}$. It is obtained by mixing the alcoholic extract of vanilla with water until a fluid of a sirupy consistence is formed, agitating with ether, evaporating the ether, treating the residual mass with boiling water, again evaporating, and purifying the crystals formed by solution and filtration through animal charcoal. It forms long colorless prisms which are nearly insoluble in cold water, but dissolve in hot water, in alcohol, and in ether, the alcoholic solution possessing a feeble acid reaction. Vanillin fuses at about 176° F., sublimes at above 300° F., and can be distilled with the vapor of water. It is prepared artificially by a number of methods. When fused with sodium hydroxide, vanillin is converted into protocatechuic acid, with formation of carbon dioxide and water; if treated with hydrochloric acid, methyl chloride and protocatechuic aldehyde are formed. *Vanillic acid* ($C_8H_8O_4$) has been obtained synthetically from coniferin ($C_{16}H_{12}O_8$) by oxidation with potassium permanganate, also by removing one methyl group from dimethyl-protocatechuic acid. It appears, therefore, to be monomethyl-protocatechuic acid. By heating a mixture of calcium vanillate and formate, vanillin—which is really the aldehyde of vanillic acid—is formed. When vanillin is treated with nitric acid, oxalic acid is produced. Vanilla is chiefly used for flavoring chocolate, confectionery, perfumery, etc., and in medicine. Revised by Ira Remsen.

Vanilla planifolia.

Vanini, vaä-nee'neĕ, Lucilio, or, as he afterward called himself in his writings, Julius Cæsar: freethinker; b. at Taurisano, near Naples, about 1585; studied philosophy, theology, and natural science at Rome and Padua; took holy orders; taught at Geneva, Paris, and Lyons; visited England; published in 1615 at Lyons his *Amphitheatrum Æternæ Providentiæ*, which, although an argument against atheism, made him suspected of being a freethinker; published next year at Paris his dialogues, *De Admirandis Naturæ, Reginæ Deæque Mortalium, Arcanis*, which was burned by order of the Sorbonne; removed to Toulouse, and began to teach, but was accused of atheism, sentenced to death by the Parliament, and burned at the stake the same day the sentence was given, Feb. 19, 1619. See David Durand, *La Vie et les Sentiments de L. Vanini* (Rotterdam, 1717), and *Œuvres philosophiques de Vanini*, by Rousselot (Paris, 1841).

Vanishing Fraction: a fraction that reduces to $\frac{0}{0}$ for a particular value of the variable which enters it. The general method of treating such cases depends on a principle of the differential calculus. The rule is as follows: Differentiate the numerator of the fraction for a new numerator, and the denominator for a new denominator; then in the resulting fraction substitute the special value of the variable. If the result is $\frac{0}{0}$, repeat the operation, and continue the repetition till a result is found which does not reduce to $\frac{0}{0}$; the final result is the required value.

Revised by S. Newcomb.

Vanishing Point: See Perspective.

Van Lennep, Henry John, D. D.: missionary; b. at Smyrna, Mar. 18, 1815; member of a distinguished Dutch family of scholars and writers; graduated at Amherst 1837; studied theology at Andover for a year; was foreign missionary in the Turkish empire 1839–69, during most of this time connected with collegiate and theological institutions in Constantinople, Smyrna, and Tocat. He traveled extensively, and became familiar with most of the Oriental languages, so that he could read and write in ten different dialects and preach extempore in five. Cataract, resulting in the loss of his sight, compelled his return to the U. S. in 1869, and afterward he devoted himself to literary labors and to education, becoming Professor of Natural Science, Greek, and Modern Languages in Ingham University, Le Roy, N. Y., 1876, and principal of Sedgwick Institute, Great Barrington, Mass., 1878, where he died Jan. 11, 1889. He was the author of *Travels in Asia Minor* (2 vols., London, 1870); *Bible Lands* (New York, 1875); and *Ten Days among the Greek Brigands* (Boston, 1874).

Van Lennep, Jacob: See Lennep, Jacob, van.

Van Liew, Charles Cecil: See the Appendix.

Vanloo' or **Van Loo**, Jean Baptiste: painter; b. at Aix, France, 1684. His father, himself an artist, taught him from a very early age, and made him copy the works of eminent masters. In 1706 he married in Toulon the daughter of an advocate, and was painting in the Dominican church there a picture of a *Holy Family* while Victor Amadeus, Duke of Savoy, was besieging the town. After this he spent five years at Aix, working in churches and painting portraits. In 1712 he went to Nice, where he painted the portraits of the Prince of Monaco's daughters, then went to Genoa and Turin, where the Duke of Saxony and Prince Carignan became his patrons. The latter sent him to Rome at his expense. He painted a *Flagellation*

there in Sta. Maria in Monticelli, and was after this summoned to Paris by Prince Carignan, who commissioned him to paint subjects from the *Metamorphoses* of Ovid and a *Triumph of Galatea*. Vanloo was especially successful in portraiture. He painted from memory a head of Louis XV., which pleased the king so well that he ordered a full length immediately. He was elected member of the French Academy in 1731, and presented the picture of *Diana and Endymion* on this occasion. A picture to commemorate the birth of the dauphin being a great success, he was further elected as adjunct professor by the Academy in 1733 and full professor in 1735. He afterward visited England, where he received innumerable commissions and honors, but after a stay of four years had to leave that country on account of his health. He died at Aix soon after his return, on Nov. 19, 1745.—CHARLES ANDRÉ VANLOO (1705–65) was brother to Jean Baptiste. He also practiced painting, and was his brother's assistant, besides producing original works, including a *Marriage of the Virgin*, now in the Louvre.—LOUIS MICHEL and CHARLES PHILIPPE AMADIE were sons of the famous Vanloo, and his pupils. W. J. S.

Van Marcke, ÉMILE: landscape and animal painter; b. at Sèvres, France, Aug. 20, 1827; pupil of Troyon. He received medals at the Salons of 1867, 1869, and 1870, and a first-class medal at the Paris Exposition of 1878; became a member of the Legion of Honor 1872. D. at Hyères, France, Dec. 24, 1890. His work is thoroughly meritorious, excellent in respect of technical qualities, strong in color and composition. It does not resemble that of his master, as has often been said of it, in the sense that it is in imitation of Troyon, but it does not rival it in any way. W. A. C.

Van Mildert, WILLIAM, D. D.: bishop and author; b. in London in 1765; educated at Queen's College, Oxford; took orders in the Church of England; became rector of St. Mary-le-Bow, London, 1796; preacher of Lincoln's Inn 1812, and Regius Professor of Divinity at Oxford 1813; Bishop of Llandaff Mar., 1819, dean of St. Paul's, London, 1820, and Bishop of Durham Mar., 1826; author of *An Historical View of the Rise and Progress of Infidelity* (2 vols., 1806; 5th ed. 1838), with copious and learned notes, being the Boyle lectures for the years 1802–05; *An Inquiry into the General Principles of Scripture Interpretation* (Oxford, 1815), being the Bampton lectures for 1814; and *Sermons on Several Occasions* (1838), preceded by a *Memoir* by Cornelius Ives. He edited the complete *Works of Daniel Waterland, D. D.* (10 vols., 1823), and prefixed an elaborate *Review of the Author's Life and Writings* (1823). D. at the episcopal palace of Bishop-Auckland, Feb. 21, 1836.

Revised by S. M. JACKSON.

Vannes, vaan: town; in the department of Morbihan, France: at the mouth of the Vannes; 10 miles from the sea (see map of France, ref. 4–C). It has a cathedral and a museum, and carries on a varied manufacturing industry. Pop. (1896) 22,189.

Van Ness, CORNELIUS PETER, LL. D.: jurist; b. at Kinderhook, N. Y., Jan. 26, 1782; studied law; practiced successfully in Burlington, Vt.; was U. S. district attorney 1809–13; representative in the Legislature 1818–21; commissioner for the settlement of the boundaries between the U. S. and Great Britain 1818–21; collector of the port of Burlington 1815–18; chief justice of Vermont 1821–23; Governor of the State 1823–26; minister to Spain 1829–37; and collector of the port of New York 1844–45. D. in Philadelphia, Dec. 15, 1852.

Vannucci: See PERUGINO, PIETRO VANNUCCI.

Vannuchi, ANDREA: See SARTO, ANDREA, del.

Van Oosterzee, JAN JACOB: See OOSTERZEE, JAN JACOB, van.

Van Ostade: See OSTADE, ADRIAN, van.

Van Rensselaer, HENRY KILLIAN: soldier; b. near Albany, N. Y., in 1744; commanded a New York regiment during the war of the Revolution; in July, 1777, was attacked near Fort Anne by a large force, which he repelled, but learning that the strong position of Ticonderoga had been abandoned by Gen. St. Clair, he withdrew. He was present at the engagements which in the following October led to the surrender of Burgoyne, in which he was severely wounded. Toward the close of the war serious disputes occurred between the authorities of New York and New Hampshire in respect to the jurisdiction of what were known as the "New Hampshire grants," and a mutiny broke out in Van Rensselaer's regiment, which was quelled only by the intervention of Washington. He afterward rose to the rank of general of militia. D. at Greenbush, N. Y., Sept. 9, 1816.

Van Rensselaer, STEPHEN: statesman; known as "the patroon"; b. in New York, Nov. 1, 1765; was the fifth in descent from Killian van Rensselaer, the original patroon or proprietor of a large tract of land on the Hudson river granted by the States-General of Holland; graduated at Harvard College in 1782; was member of the Assembly in 1789; was chosen to the State Senate in 1790; became Lieutenant-Governor in 1795; and was a leader of the Federalists in New York State for several years. In 1810 he was appointed one of the commissioners to explore the proposed line for a canal from Lake Erie to the Hudson, and to report upon the feasibility of its construction, and from 1816 to his death one of the canal commissioners. He was in command of the State militia at the beginning of the war of 1812, and directed the unsuccessful assault upon Queenston Heights. In 1819 he became a regent of the New York University, of which later he was chancellor; in 1821–23 instituted the geological surveys of New York, which were executed wholly at his cost by Amos Eaton, and in 1824 established at Troy a scientific school for the instruction of teachers, which was incorporated in 1826 as Rensselaer Institute, half the current expenses being for some time defrayed by him. He was a Representative in Congress 1823–29, and it was by his casting vote in the New York delegation that John Quincy Adams was made President of the U. S. D. in Albany, Jan. 26, 1839. He published *A Geological and Agricultural Survey of the District Adjoining the Erie Canal* (1824).

Van Rooy, ANTON: See the Appendix.

Van Sant'voord, GEORGE: lawyer and *littérateur*; b. at Belleville, N. J., Dec. 8, 1819; graduated at Union College in 1841, holding a high position for scholarship and belles-lettres; studied law at Kinderhook, and was admitted to the bar in 1844; removed the same year to Lafayette, Ind.; during a two years' residence here published *The Indiana Justice: a Treatise on the Jurisdiction, Authority, and Duty of Justices of the Peace in Civil and Criminal Cases*, a standard work in that department; returned to Kinderhook in 1846, and pursued his profession there for five years, when he formed a law-partnership with David L. Seymour, of Troy, N. Y., to which place he afterward removed; was elected to the State Assembly in 1852 and in 1856; was district attorney for Rensselaer County from 1860 until Mar. 6, 1863, when he was killed in a railway accident at East Albany. He was a man of great literary activity, and besides other works and articles published *Principles of Pleading in Civil Actions under the New York Code of Procedure* (1852); *A Treatise on Practice in the Supreme Court of the State of New York in Equity Actions* (1860–62); *Life of Algernon Sydney* (2d ed. 1853); *Lives of the Chief Justices of the Supreme Court of the United States* (1854; bringing the record down to the closing years of Chief Justice Taney's service on the bench); and from time to time in the *Democratic Review*, monographs on *Cathoun*, *Sir Henry Vane*, *Oliver Cromwell*, *Carnot*, *Robespierre*, *Vergniaud*, *Danton*, etc. Revised by F. STURGES ALLEN.

Van Schaack, PETER, LL. D.: lawyer and author; b. at Kinderhook, N. Y., in Mar., 1747; graduated at King's (now Columbia) College in 1766; studied law and was admitted to the bar in 1769, and began his practice in the city of New York; in 1773 was appointed to revise the statutes of the colony of New York, and was an active member of several colonial committees appointed to consider the measures of the British Government which led to the Revolution; in 1775 removed to Kinderhook, and in the following year lost the sight of his right eye. Although he considered the acts of the British Government unauthorized and unjust, he was on principle opposed to the Revolution, for which reason he was summoned before the committee on conspiracies Jan. 9, 1777, and on refusing to take the oath of allegiance to the State of New York was sent to Boston; in the next April he was allowed to return to his home on parole; in 1778, owing to the death of his wife, his unpleasant situation due to hostility to the Revolution, and his desire to seek medical advice to regain his eyesight, he sailed for England, having been previously summoned before the commissioners and ordered to be banished; in 1785 he returned, a special statute having been passed which restored him to the rights of citizenship, and upon his readmission to the bar took up the practice of law, acquiring a wide reputation as an instructor and practitioner. D. at Kinderhook, Sept.

27, 1832. He published *Laws of the Colony of New York* (2 vols., New York, 1773) and *Conductor Generalis, or the Duty and Authority of Justices, Sheriffs, Coroners, etc.* (1788). See his *Life*, by Henry C. Van Schaack (1842).

Van't Hoff, Jacobus H.: See the Appendix.

Van Tromp: See Tromp, van.

Vanuxem, Lardner: geologist and chemist; b. in Philadelphia, Pa., July 23, 1792; trained for business pursuits, but abandoned them for scientific study, spending 1816–19 at the École des Mines, Paris, in the study of chemistry and natural history; Professor of Chemistry and Mineralogy 1820–26 in South Carolina College, Columbia, S. C.; studied the geology of New York, Ohio, Kentucky, Tennessee, and Virginia 1827–28, making a report thereon to the Legislature of New York; geologist of the State of New York 1836–42, having charge of work in the third district. He is best known through his report on the geology of New York, but among his publications is *An Essay on the Ultimate Principles of Chemistry, Natural Philosophy, and Physiology*, which is memorable in that it announces (in 1827) the qualitative interconvertibility of heat, light, electricity, and magnetism. D. near Bristol, Pa., Jan. 25, 1848. G. K. G.

Van Veen, Otho, also called Ottovenius: painter; b. in Leyden about 1556; studied in Liège, then for eight years in Rome; settled in Brussels as painter to Alexander Farnese; removed afterward to Antwerp, where he established a school in which Rubens received his first instruction; returned finally to Brussels, where he died as master of the mint about 1630. The most remarkable of his paintings are a portrait of Alexander Farnese and some religious pictures in Brussels and Antwerp.

Vanvitel'li, Luigi: architect; b. in Naples in 1700. He was the son of Gaspar van Witel (1650–1736), a Dutch painter who settled in Italy and whose name was Italianized to Vanvitelli. Although he painted from an early age and at twenty had already decorated the chapel of the relics in Santa Cecilia with frescoes, he preferred devoting himself to architecture, which he studied under Filippo Juvara. The Cardinal of San Clemente took him to Urbino to restore the Albani Palace there. He worked at the churches of San Francesco and San Domenico at the same time. At the age of twenty-six he was appointed architect of St. Peter's, and from that moment directed all the great works of his time. For St. Peter's he copied many pictures which were reproduced in mosaic in the nave. He fortified the cupola with iron bands, as there were cracks which threatened to extend themselves. The pope intrusted Vanvitelli with the works at Ancona. There he constructed a quay and a lazaretto, besides making many restorations in the chapel of the relics of San Ciriaco and in churches at Macerata, Perugia, Pesaro, Foligno, and Sienna. In 1745 he designed a façade for Milan cathedral in a style combining the Gothic with the Classic, but this project was not carried out. His fame was so great that Charles III., wishing to erect an unrivaled palace in Caserta, chose Vanvitelli for its architect. In this building he was eminently successful, as also in an aqueduct to join two mountains not far from the Caudine Forks, this structure having three rows of arches one above the other, rising to an immense height. D. in Naples, Mar. 1, 1773.

Van Wert: city; capital of Van Wert co., O.; on the Cin., Jack. and Mack. and the Penn. railways; 27 miles W. N. W. of Lima, 32 miles E. S. E. of Fort Wayne, Ind. (for location, see map of Ohio, ref. 3–C). It is in an agricultural region, and has 2 national banks with combined capital of $160,000, and a daily and 3 weekly newspapers. Pop. (1880) 4,079; (1890) 5,512; (1900) 6,422.

Van Wyck, Robert A.: See the Appendix.

Vapereau, vaap'rō', Louis Gustave: author and administrator; b. at Orleans, France, Apr. 4, 1819; completed his education at the École Normale in Paris; taught philosophy and German at the College of Tours 1843–52; settled in the latter year in Paris, and became in 1854 chief editor of the *Dictionnaire Universel des Contemporains* (1858; 6th ed. 1891–93). He also edited *Dictionnaire Universel des Littératures* (1876), and published *Année littéraire et dramatique* (11 vols., 1859–69) and *Éléments d'histoire de la littérature française* (2 vols., 1883–85). In 1870–71 he was successively prefect of Cantal and Tarn-et-Garonne; in 1877–88 was inspector-general of primary schools; then was appointed honorary inspector-general.

Vapors: the gaseous forms of substances which under normal conditions usually exist in a liquid or solid state. They are distinguished from gases proper, which are elastic fluids under ordinary conditions. The vapor of water, called Steam (*q. v.*), is a transparent gas, and should be carefully distinguished from the cloud produced by a jet of steam, which is condensed water.

Determination of the Density of Vapors.—Owing to the near relations which the atomic weight of the elements and the composition of compounds bear to the specific gravity of their vapors, the accurate determination of the latter at a known temperature and pressure, in comparison with that of an equal volume of air at the same temperature and pressure, possesses very great importance. Of the numerous methods proposed for this determination, those suggested by Gay-Lussac and by Dumas are most often employed; other processes proposed by Deville and Troost, Regnault and Hofmann, and by Victor Meyer are also used for special purposes. In the determination of vapor-densities it is necessary that the substance be completely volatile without decomposition, that it be entirely free from bodies possessing lower or higher boiling-points, and that it be perfectly dry.

Gay-Lussac's method is employed in cases where the density of a liquid which boils at about 212° F. is to be determined. In it a known weight of the substance is converted into vapor at a definite temperature, and its volume accurately measured. The density is then calculated by dividing the weight of the substance by the weight of an equal volume of air at the same temperature and pressure.

Dumas's method consists in filling a glass bulb of known weight and known capacity with the vapor under investigation and weighing. From the data thus obtained the weight of a given volume of the vapor can be calculated, and therefore also the density.

Hofmann's method, which is based upon that of Gay-Lussac, is as follows: A graduated glass tube is first completely filled with mercury, and then dipped in a mercury bath, when a barometric vacuum of several millimeters will be formed in the top; this portion of the tube is then inclosed within another tube which is drawn out at its upper extremity to a conducting tube having a moderate width and bent at a right angle. This tube connects with a copper or glass vessel in which water or other liquids can be boiled. The outer tube is closed at the bottom with a cork having two openings, in one of which the barometric tube is inserted, in the other an escape-tube. In this way a current of vapor of water or other volatile liquid can be made to traverse the space between the two tubes, thus maintaining the upper part of the barometric tube at the temperature desired in the determination. The substance under examination is introduced into the barometric vacuum in a small glass tube provided with a ground-glass stopper, which is afterward forced out by the expansion of the vapor. In other respects the determination is made as in Gay-Lussac's method. The above method is very advantageous in that, under the very slight pressure to which the inclosed vapor is exposed, the determination may be made at a comparatively low temperature. The vapor-densities of liquids, for instance, which boil as high as 300° F., can be ascertained at the boiling-point of water.

Victor Meyer's method consists in heating a known weight of a substance above its boiling-point in a closed vessel so arranged that any air driven out of the vessel can be collected and measured. The volume of air displaced gives the volume of the vapor.

Revised by Ira Remsen.

Tension of Vapors.—If a closed vessel be partly filled with any liquid, the space above the surface of the latter being occupied by its vapor, it will be found that whatever temperature the vessel be subjected to, the vapor will exert a certain definite pressure which depends only upon the temperature and the nature of the vapor. The tension of vapors is easily demonstrated by the following experiment, in which three barometer tubes are filled and inverted with a common cistern. Into one of these, b'', is introduced a few drops of ether, into another, b', a little water. The result will be a depression of the two columns below the level of b. The tube containing ether will be lowered to about half its former height; that containing water will fall only 1 or 2 cm. For the measurement of vapor tensions as a function of the temperature more elaborate methods than the above must be employed. Important cases of vapor tension are those of water vapor and

of the vapor of mercury. The former is tabulated in the article on STEAM (*q. v.*), and the latter is given in Table I., while the tensions of a few other common vapors are given in Table II.

TABLE I.

Tension of mercury vapor (according to measurements by Regnault and by Hertz).

Temperature.	Tension (in cm. of mercury).	Temperature.	Tension (in cm. of mercury).
0° C.	0·00002	140° C.	0·194
20° C.	0·00013	200° C.	1·826
40° C.	0·00064	250° C.	7·575
60° C.	0·0026	300° C.	24·215
80° C.	0·0094	350° C.	66·318
100° C.	0·0287	400° C.	158·796

TABLE II.

Vapor tensions of several liquids.

Temperature.	Alcohol (in cm. of mercury).	Ether (in cm. of mercury).	Carbon dioxide (in atmospheres).	Ammonia (in atmospheres).	Sulphur dioxide (in atmospheres).
−20° C.	0·334	6·9	19·93	1·83	0·63
−10° C.	0·650	11·5	26·76	2·82	1·00
0° C.	1·273	18·4	35·40	4·19	1·53
20° C.	4·400	43·3	58·84	8·41	3·24
40° C.	13·400	90·7	91·03	15·26	6·15
60° C.	35·000	172·5	.....	25·63	11·09
80° C.	81·280	302·3	.....	40·59	18·09
100° C.	168·500	495·3	.....	61·32	27·82
120° C.	321·970	771·9	.....	.....	41·56

See, further, HEAT, LIQUIDS, and PNEUMATICS.

E. L. NICHOLS.

Var: department of France, bordering S. and S. E. on the Mediterranean; area, 2,349 sq. miles. It is mountainous, covered with spurs of the Alps, and rich in forests and useful minerals, especially coal and iron. In the valleys wheat, wine, olive oil, and all kinds of fruit are produced in abundance, and a considerable manufacturing industry is carried on, comprising silk and woolen goods, glass, pottery, and canned goods. There is considerable trade. Pop. (1896) 309,191. Capital, Draguignan.

Varangian Guards and Varangians: See NORMANS.

Varan'idæ [Mod. Lat., named from *Vara'nus*, the typical genus, from Arab. *waran*, *waral*, a kind of lizard]: a family of pleurodont lizards confined to the Old World. The body has the typical lizard form; the scales are small, roundish, and disposed in transverse lines; the head is covered above with small scales or shields, and bony superorbital plates are developed; the mouth is well cleft; the teeth attached to the inner side of the jaws; the tongue is long, slender, and bifid, and its base receivable in a membranous sheath; no femoral pores. The family includes some of the largest of known lizards; they are swift in their motions, and move in a somewhat serpentine manner; they feed chiefly on insects and the eggs of birds, reptiles, etc. The most noteworthy species is the monitor of Egypt (*Monitor niloticus*), so called because it was anciently supposed to give a warning or monitorial hissing or whistling noise on the approach of a crocodile. Modern Egyptians, it is said, believe that the species is a neglected young crocodile hatched on dry land. It is represented on ancient Egyptian monuments, probably because of the fact that it devoured the eggs of the crocodile. It lives near the water, and attains a length of 5 or 6 feet. Revised by F. A. LUCAS.

Varas, ANTONIO: statesman; b. at Cauquenes, Chili, in 1817. He was educated at the national institute, in which he subsequently became a professor, also practicing law in Santiago. In politics he was an extreme conservative. Under President Bulnes, 1845–50, he was Minister of Justice; and during the presidential campaign for the election of Bulnes's successor he organized the party which is still known as the Montt-Varistas. Largely through his management Señor Montt was elected, and Varas was his chief minister from 1850 to 1856, when he resigned. In 1861 he was again chief minister for a short time, and declined a presidential nomination. Subsequently he was prominent in congress. He was one of the first jurists of Chili. D. at Santiago, 1886. H. H. S.

Varchi, vaär'kee, BENEDETTO: historian; b. in Florence, Italy, Mar. 29, 1503. He studied jurisprudence in Pisa, and became solicitor and notary in Florence; soon renounced the law, and led a wandering life for some years; was recalled to Florence by Cosimo I. in 1543, and charged with the task of writing the recent history of the city; took holy orders at sixty-two years of age, but died in Florence, Dec. 18, 1565. His chief work is the *Storia fiorentina*, which covers the period from 1527 to 1538. Among his lesser writings are the *Ercolano* (1560), a dialogue on the proper name for the Italian speech; *Lezioni sul Dante e prose varie* (1543–45); the *Suocera*, a comedy; and his *Sonnetti*. See the edition of the *Storia fiorentina* by Gaetano Milanesi (Florence, 1857, life prefixed), and of prose works (Florence, 1841–42). J. D. M. FORD.

Var'döe: island of Norway; in the Arctic Ocean; in lat. 70° 20′ N., lon. 31° 10′ E. It contains a town and fort, has a considerable commerce in fish and whale oil, and is one of the most northerly places in Europe that is inhabited. Pop. 2,200.

Varela, vaä-rā'laä, HECTOR FLORENCIO: journalist, author, and diplomat; b. at Montevideo in 1833. He received his early education in his native city, but during the dictatorship of Rosas his father was assassinated, and he was forced to remove to Rio de Janeiro. After the fall of Rosas in 1852 he returned and founded *La Tribuna*, which became one of the most important journals in South America. In 1868 he left Montevideo, settling in Buenos Ayres, and has been active in politics, has held diplomatic positions in South America and Europe, and is a distinguished orator. His numerous published works include romances, sketches, criticism, and historical and political essays. H. H. S.

Varese, vaä-rā'se: town; province of Como, Italy; on one of the extreme spurs of the Rhætian Alps; about 35 miles N. of Milan (see map of Italy, ref. 2–C). Its nearness to Lago Maggiore and Switzerland has made it a place of some trade, and the fine climate and scenery make it attractive as a summer residence. It has manufactures of silks and other articles. The sanctuary known as Sta. Maria del Monte, on a hill about 5 miles N. W. of the town, is an object of special attraction to the devout Roman Catholic, on account of an image of the Virgin consecrated by St. Ambrose. Varese was a Roman town of importance, and the small lakes near it were inhabited in prehistoric times. Pop. about 5,870. Revised by M. W. HARRINGTON.

Var'gas, JOSÉ: surgeon and politician; b. in Venezuela in 1786; was educated at the University of Caracas, and subsequently studied medicine in Edinburgh; after traveling in England, France, and Spain, entered upon practice in the island of Puerto Rico, becoming the foremost surgeon in the West Indies. Returning to Venezuela, he became Professor of Anatomy, Surgery, and Chemistry in the University of Caracas, of which he was subsequently rector. His lectures, which were published, were the text-books in the university, and he gathered the largest collection of plants and minerals and the finest private library in Venezuela. He also took an active part in public affairs; was a member of the first congress of the republic in 1821, president in 1834, and subsequently senator and councilor of state. D. in New York, July 14, 1854.

Vargas, LUIS, de: painter; b. at Seville, Spain, in 1502; studied painting in Italy, residing chiefly in Rome for nearly thirty years, after which he returned to his native city, where he executed large oil-paintings and frescoes for the churches; was regarded as the chief of the Seville school; hastened his end by his rigorous austerities, being accustomed, among other ascetic practices, to sleep in a coffin. Among his paintings are *Adam and Eve*, *Jesus bearing his Cross*, and *La Generación*, representing the parents and ancestry of Christ, all of which are preserved in Seville. D. at Seville, in 1568.

Variables [from Lat. *varia'bilis*, variable, admitting of variation, deriv. of *varia're*, vary]: quantities which admit of an infinite number of sets of values in the same equation. Thus in the equation $y^2 = 2px$, x and y are variables, because there is an infinite number of sets of values of these quantities that satisfy the equation. If there are two or more variables in an equation, all but one may be regarded as *independent*; that is, we may assign values to them at pleasure, but the value of the remaining one must then be such as to satisfy the given equation. Because one variable always depends on the form of the equation, as well as on the values assigned to the others, it is called the *dependent* variable or the *function*. In the rectangular equation of lines, x, or the abscissa, is commonly taken as the independent variable, and y, or the ordinate, as the function: in the rectangular equation of surfaces, x and y, or the abscissas,

are taken as independent variables, and z, or the ordinate, as the function. In the polar equation of a line the radius vector is regarded as the function, and the corresponding angles are regarded as independent. These are the conventional rules, but any variable may be regarded as the function, the other varying elements being regarded as independent. See FUNCTION. Revised by S. NEWCOMB.

Variation: See DARWINISM and EVOLUTION.

Variation of the Needle: the changes in the declination, or deviation from the true meridian, of the magnetic needle. A daily variation of several minutes exists, owing to the influence of the sun; at about eight o'clock in the morning the needle is at its extreme eastern position, and at about one o'clock in the afternoon it is at its extreme western position. The amount of this daily variation is greater in summer than in winter, this constituting an annual variation of about 1½′. There are also variations corresponding to the period of solar rotation and to the lunar inequalities, but these are too small to be noticed except in observations with very precise apparatus. Irregular variations due to magnetic storms are of temporary duration and of uncertain amount. The secular variation of the declination is the most important, since by it changes of several degrees are produced. This is of a periodic character, a complete cycle being made in from two and a half to five centuries, at different places. Observations in Paris since 1540 have enabled the curve to be traced for nearly three-fourths of a cycle; in 1580 the extreme eastern declination of 9½° E. was reached, and in 1810 the extreme western declination of 22½° W. was observed, a semi-oscillation of 32° amplitude being completed in 230 years. In the U. S. the period is generally less than 300 years, although a complete cycle has not been observed in any place. In New York city the western elongation of 9·3° W. occurred in 1630, and the eastern elongation of 4·3° W. in 1789, a semi-oscillation of 5° taking place in 159 years. These secular changes cause a constant shifting of the lines of equal declination on an isogonic map (see map for 1890 in the article MAGNETISM, TERRESTRIAL), the amount of shifting being quite different for different localities. Formulas for the declination at numerous places have been deduced by the U. S. Coast and Geodetic Survey. For example, in Boston, Mass., the western declination is equal to

$$9{\cdot}48^\circ + 2{\cdot}94^\circ \sin(1{\cdot}3^\circ m + 3{\cdot}7^\circ),$$

in which m denotes the number of years after 1850, or if taken with a minus-sign, the number of years before 1850. The probable year of maximum declination is found by making $1{\cdot}3^\circ m + 3{\cdot}7^\circ$ equal to 90°, whence $m = 66$, and the year is $1850 + 66 = 1916$. By equating $1{\cdot}3^\circ m + 3{\cdot}7^\circ$ to -90° the year of minimum declination is found to be 1778. The period of a semi-oscillation is then 138 years, with a total variation of 5·88°. A secondary variation in the secular variation has been discovered at all places where observations have been long continued. In Paris this has a period of about sixty years and an amplitude of about 1°. In the formula this secondary variation is expressed by adding a second term. Thus for Philadelphia, Pa., the formula is

$$5{\cdot}36^\circ + 3{\cdot}17^\circ \sin(1{\cdot}50^\circ m + 26{\cdot}1^\circ) + 0{\cdot}19^\circ \sin(4^\circ m + 146^\circ),$$

which shows that the secondary variation has a period of twenty-five years and an amplitude of 0·38°. The *Report of the United States Coast and Geodetic Survey* for 1888 gives a collection of observed magnetic declinations, together with formulas for sixty-six stations in the U. S. and fourteen stations elsewhere. MANSFIELD MERRIMAN.

Variations, Calculus of: the calculus by which the value of a function or the form of a curve or surface is determined, when certain conditions to which they must be subject are assigned. John Bernouilli proposed (1696) to the mathematicians of his day the following problem: Given, two points, A and B, in a vertical plane, to find the path or curve by which a body under action of gravity will descend from A to B in the least possible time. In this problem (since known as that of the *brachystochrone*—from Gr. βράχιστος, superlative of βραχύς, short + χρόνος, time) was the germ of the subsequently developed *calculus of variations*. The peculiarity of the problem lies in this, that a curve is to be found no element of which is given; no condition establishing directly a condition between its elements (or parameters); nor any relation governing the relative increments of its co-ordinates. It was thus taken out of the sphere of pure geometry, and was beyond the methods of the differential calculus. The new problem was to find a curve which should fulfill a certain condition—i. e., that it should be the minimum-time path of descent, by action of gravity, of a body falling from one of its given points to the other and lower given point. Solutions were given by the proposer and his brother, James Bernouilli, and by the Marquis de l'Hôpital. Subsequently Euler took up the subject and developed what (in his predecessors) had been mere solutions of a particular problem into an almost complete science. But it remained for the illustrious Lagrange to separate the principles of the calculus of variations from the geometrical considerations from which his predecessors had derived them; to establish a pure analytic basis; to invent a simple and definite notation; and thus to open a new and extensive field for its future applications. To Lagrange, therefore, is usually attributed the calculus of variations as it is now presented. The *History of the Calculus of Variations* has been written by Todhunter. A standard English treatise is that of Jellett (Dublin, 1850). Carll's *Calculus of Variations* (New York, 1881) is the best work on the subject now at the command of the American student. It is remarkable for being the work of a blind man.

Revised by S. NEWCOMB.

Varicose Veins [*varicose* is from Lat. *varico'sus*, full of dilated veins, deriv. of *va'rix*, *va'ricis*, a dilated vein, deriv. of *va'rus*, bent, stretched]: relaxation of the coats of the superficial veins, with increased caliber, occurring most frequently in the lower extremities. Gravitation, the weight of the venous blood-column above, and the difficulty of the ascent of blood from the feet to the body, determine the greater frequency of the disease in the veins of the legs. Varicose veins are common in aged men, the result of senile degeneration of the various tissues, including attenuation of the coats of vessels; less often it occurs in mid-life in robust men of the gouty habit, and those who are kept constantly standing; walking does not favor the condition, since the movements of the superficial muscles and tension of the integument help to lift the blood upward. Even in youth violent exercise, as in the gymnasium, by unduly taxing the tension of the vascular system, causes a breaking down of the valves in the veins and venous dilatation or varicosity. In women the chief and not unfrequent cause is pregnancy. Women who have borne several children will often have marked varicose veins, the result of the pressure of the gravid uterus upon the veins in the pelvic cavity, and consequent detention of the venous blood in the lower extremities. Varicose veins occur exceptionally in other parts of the body—upon the scalp and side of the neck, and upon the abdomen in the region of the groin. Varicocele in the male is a local varicosity of the spermatic veins. Hæmorrhoids or piles are due to repeated passive congestions of the hæmorrhoidal veins at the verge of the anus; obstruction to the portal circulation is the primary cause, which, if of frequent recurrence and long standing, leads to varicose veins, or piles. Varicose veins, as seen in the lower extremities, are increased in diameter with inequalities of caliber, and present nodular enlargements or pouches at intervals; there are greater relaxations at the site of former valves or at the points of division of veins. The veins are also tortuous, since the longitudinal fibers of the coat are relaxed no less than the circular; the tortuosity accommodates the increased length of the vessel and favors the ascent of the blood. Varicose veins do not necessarily indicate debility or degeneration, but should warn the patient at once to abandon vocations involving violent exertion, to regulate the diet and bowels habitually, and to neutralize and remove any rheumatic or gouty vice. The varicose limb may be benefited by daily friction, cold effusion, and salt bathing. But the extension of the disease is best checked, and the best prospect of cure insured, by constant external support. This is secured by uniform bandaging, or by wearing an elastic stocking or laced leg-corset. The elastic stockings made of silk and rubber webbing are of the greatest value to those who can afford to keep them constantly renewed when stretched by wear. An inferior stocking, by stretching at points, leaves bands of circular constriction which aggravate the disease rather than give the intended benefit. The cheapest and most efficient appliance is a case or corset of strong jean fitted to the shape of the limb and lacing up in front. Varicose veins are radically cured by ligation and by hypodermic injection of styptics within the veins. Either process may result in local ulceration and failure. The latter method carefully performed may afford permanent relief; but in this it is necessary to

bandage the part tightly for several hours in order to prevent blood-clots from reaching the heart and vessels of the trunk. Revised by WILLIAM PEPPER.

Varinas, or **Barinas**: See BARINAS.

Variola: See SMALLPOX.

Varius, LUCIUS RUFUS: a Roman poet of considerable reputation among his contemporaries; the friend of Horace and Vergil, who in conjunction with Tucca edited the *Æneid* after Vergil's death. He wrote epic poems in glorification of Cæsar and Augustus, and a tragedy, *Thyestes*, highly esteemed by Quintilian. See Ribbeck, *Tragicorum Romanorum Fragmenta*, and Baehrens, *Fragmenta Poet. Rom.* M. W.

Varna (more correctly **Warna**): seaport-town of Bulgaria; on the west coast of the Black Sea between the Danube delta and the Bosphorus, on the Bay of Varna (see map of Turkey, ref. 3–E). Though its harbor is open, being sheltered only on the N. and N. E. from the dangerous winds of the Black Sea, it was entered in 1893 by 379 ships with a tonnage of 234,913. Since 1867 it has been connected with Rustchuk (115 miles distant) by a railway, and has a large export trade in wheat, barley, wool, leather, wax, honey, fruit, and wood with Constantinople and the west of Europe. More than 3,740,000 gal. of wine is produced annually within the district of Varna. There are rich industrial establishments, including breweries, distilleries, tanneries, soap-factories. The city is the seat of a Greek metropolitan and since 1870 of a Bulgarian bishop, has a gymnasium, 5 churches, and 8 mosques, and the tomb of Ladislaus III. of Poland and Hungary, who was slain at the battle of Varna (1444). Its strong fortifications were destroyed by the action of the Congress of Berlin in 1878, but have been replaced with earthworks by the Bulgarians, so that it forms with Shumla, Rustchuk, and Silistria the Bulgarian quadrilateral. Originally an ancient Milesian colony, *Odessus*, it is historically very memorable, having been the place where the allies organized the invasion of the Crimea during the war with Russia in 1854–55. Pop. (1893) 28,174. HERMANN SCHOENFELD.

Varnhagen, vaär-aa'gen, FRANCISCO ADOLPHO, de: historian; b. at São João de Ypanema, São Paulo, Brazil, Feb. 17, 1816. His father was a German engineer in the Portuguese service. Young Varnhagen was early taken to Portugal, where he was educated in the royal military college and served in the army against Dom Miguel 1833–34. Subsequently he devoted himself to historical researches. Returning to Brazil he became a subject of that empire in 1841, and during most of the remainder of his life held diplomatic positions in South America and Europe. He was unquestionably the first of the Brazilian historians both in the profundity of his researches and in clearness of argument and statement; but he was somewhat dogmatic and impatient of opposition, clinging tenaciously to his own views on minor points, even when the weight of evidence was against him. His most important work is the *Historia geral do Brazil* (2 vols., 1854–57; revised ed. 2 vols., 1875). Others are *Historia das lutas com os Hollandezes no Brazil* (2d ed. 1874); several brochures on Vespucius, and various papers in the *Revista do Instituto historico do Brazil* and other journals. He edited and published many important historical documents. He was created Baron and in 1874 Viscount of Porto Seguro. D. in Vienna, Austria, June 29, 1878. HERBERT H. SMITH.

Varnhagen von Ense, vaär'haa-gen-fon-en'se, KARL AUGUST: soldier and author; b. at Düsseldorf, Feb. 21, 1785; was educated at Hamburg; studied medicine, then philosophy and literature at Berlin, Halle, and Tübingen, and published in 1804 a *Musenalmanach*, together with Chamisso. In 1809 he entered the Austrian army, fought in the battles of Aspern and Wagram, and after the conclusion of peace accompanied Gen. Prince Bentheim as adjutant on his diplomatic journeys to Prague and Paris. In 1812 he received a position in the Prussian civil service, but in 1813 entered the Russian army as a captain; served in Tettenborn's corps during its campaign from Hamburg to Paris, and wrote *Geschichte der Kriegszüge Tettenborns* (1814). After the fall of Paris, he accompanied Prince Hardenberg to the Congress of Vienna, and went in 1815 as Prussian minister to Carlsruhe, but removed in 1810 to Berlin, where he subsequently resided till his death Oct. 10, 1858, devoting himself to literature. In 1814 he married Rahel Levin, a rich Jewess (b. in 1771), much noted for the chivalric homage which Prince Louis Ferdinand of Prussia (d. in 1807) had paid her, and most remarkable for the power and brilliancy of her intellect and for the energy and nobleness of her character. In Berlin she formed the center of a large circle encompassing all the greatest talents in art, literature, science, and politics; after her death (in 1833) her husband published *Rahel, ein Buch des Andenkens für ihre Freunde* (3 vols., 1834), containing selections from her posthumous papers, and *Galerie von Bildnissen aus Rahels Umgang* (2 vols., 1836), a series of literary sketches. This last kind of production, the biography, the literary portrait, was the true field for the talent of Varnhagen von Ense, and his *Goethe in den Zeugnissen der Mitlebenden* (1823) and *Biographische Denkmale* (5 vols., 1824–30) are, like most of his writings, highly important documents for the understanding of his time. The influence of his classical style and of his exquisite art of drawing literary portraits is very evident in the development of German historiography. After his death were published his *Tagebücher* (14 vols., 1861–72); *Blätter aus der preussischen Geschichte* (1868); *Biographische Porträts* (1871); *Briefe von Alexander von Humboldt 1827–58* (1860), etc., which works gave many surprising revelations with respect to characters and events of his time. Revised by JULIUS GOEBEL.

Varnish [M. Eng. *vernish*, from O. Fr. *vernis*, deriv. of *vernir*, to varnish < Late Lat. **vitrini're*, deriv. of *vitri'nus*, glassy, deriv. of *vi'trum*, glass]: a resinous solution employed for coating various objects in order to produce a thin, transparent, and hard surface, forming a protection against moisture and air. The principal resins employed are the gums copal, shellac, animé, mastic, and sandarac; the solvents being alcohol, wood-spirit, oil of turpentine, linseed, and other drying oils. From the nature of the solvent used varnishes may be conveniently divided into fixed-oil, spirit, volatile-oil, and ether varnishes.

Fixed-oil varnishes, which possess great durability and luster, are usually prepared from linseed oil, which, on being oxidized by the action of the air, is converted into a tough, elastic substance, the change taking place more rapidly in a boiled oil, which possesses greater siccative power. In the preparation of the oil for the manufacture of varnish, it is boiled in a copper vessel in the presence of litharge, zinc oxide, or manganese dioxide, by the action of which the *linolein* of the oil is partially converted into linoxine. The resin is then fused in a caldron, and the boiled oil, heated to about 300° F., is gradually added, with constant stirring. As soon as a complete admixture between the resin and oil has been effected, the caldron is removed from the fire and allowed to cool partially, when heated oil of turpentine is added in a thin stream until the mixture acquires a proper consistence. The proper amount of linseed oil to be added to the resin can be determined by taking out a drop of the fluid every few moments and allowing it to cool on a glass plate, when, if the proportions of oil and resin are correct, it will remain limpid and wax-like; in case it becomes hard and brittle, more oil is required. It is considered necessary to boil the mixture of linseed oil and resin before adding the oil of turpentine. The quality of the linseed oil used is of importance; a pale limpid oil, which is prepared from full-grown and ripe seeds, and does not change the color of the varnish to any great extent, should be employed. The proportions by weight of the ingredients composing an ordinary oil varnish are as follows: resin (copal, amber, etc.), 10; boiled linseed oil, 5 to 25; oil of turpentine, 15 to 25. As a rule, varnishes of this composition improve with age. An amber varnish, which possesses great durability, but dries slowly, has the following composition: resin (*amber colophonium*), 1 lb.; boiled linseed oil, 10 oz.; oil of turpentine, 1 pint. A good carriage varnish is made from gum animé, 8 lb.; boiled linseed oil, 3 gal.; camphor, ¼ lb.; litharge, ¼ lb.; oil of turpentine, 5½ gal. A black asphalt varnish, suitable for ironwork, can be made from asphalt, 3 parts by weight; boiled linseed oil, 4; oil of turpentine, 15 to 18; or from foreign asphalt, 45 lb.; linseed oil, 6 gal.; litharge, 6 lb.; boil, then add dark fused gum amber, 8 lb.; hot linseed oil, 2 gal.; boil again, remove from the fire, and thin down with oil of turpentine, 25 gal. A good wainscot or mahogany varnish is obtained from sorted gum animé, 8 lb.; clarified linseed oil, 3 gal.; litharge, ¼ lb.; dried lead acetate, ¼ lb.; oil of turpentine, 5½ gal. The addition of India-rubber or gutta-percha to oil varnishes imparts further flexibility to the product.

Spirit varnishes (*lac varnishes*) differ from the preceding in being true solutions of resins. The solvents most employed are alcohol and wood-spirit. Acetone, benzene, etc., are also occasionally used. The gums chiefly employed are sandarac, mastic, shellac, and animé. Sandarac confers hardness on varnishes; mastic imparts a gloss. Shellac is rendered more soluble by being powdered and exposed to the air for a long time. The spirit used as the solvent should not be less than 95 per cent. in strength. In the preparation of spirit varnishes the resins, before being added to the solvent, should be well pulverized and mixed with sand or broken glass, in order to prevent the gum from agglutinating into lumps. The solution is accomplished in a still heated in a steam-bath, the varnish being filtered, first through silk, then through filter-paper. The tendency of the varnish to "chill" or give a rough surface is obviated by the addition of a little concentrated ammonia or gum sandarac, excessive brittleness being remedied by the addition of Venice turpentine. Sandarac varnish is prepared by dissolving 10 parts of the gum and 1 part of Venice turpentine in 30 parts of spirit. Ordinary copal varnish is made by first melting the resin at a gentle heat, then pulverizing and mixing it with sand, dissolving in strong alcohol, and filtering. Elemi resin, or solution of turpentine, is sometimes added to give greater softness. A colorless copal varnish is prepared by dissolving 6 parts of pulverized and fused copal in 6 parts of strong alcohol in a closed vessel, and adding 4 parts of oil of turpentine and 1 part of ether. Colored spirit varnishes, or *lacquers*,* are commonly used to impart a gold color to instruments made of brass and other base metals. Tinctures of gummi-gutta, dragon's blood, gamboge, coralline, picric acid, turmeric, Martius yellow, annotto, etc., are separately prepared and added in the proportions necessary to give the required color to a varnish consisting of seed-lac, 2 parts; sandarac, 4 parts; elemi, 4 parts; alcohol, 40 parts. The following mixture furnishes a good gold lacquer for brasswork; seed-lac, 3 oz.; turmeric, 1 oz.; dragon's blood, ¼ oz.; alcohol, 1 pint. Aniline colors have been employed to impart various tints to spirit varnishes, which are especially adapted to the coloring of glass, the bronzing of leather, etc.

Volatile-oil varnishes are prepared in the same manner as the preceding, the solvent being oil of turpentine. They are more durable than spirit varnishes, and are less brittle, but require more time in drying; they also differ from the latter in improving by age, whereas spirit varnishes usually deteriorate in quality. The resins employed (gum copal, gum damar, Canada balsam, etc.) are commonly directly dissolved in the oil of turpentine, with or without previous fusion, the usual proportions being about 5 lb. of the resin to 7 lb. of the solvent.

Ether varnishes consist simply of an ethereal solution of a resin. They have a very limited application. The following is sometimes used for the repairing of jewelry: copal, 5 parts; ether, 2 parts. A varnish for photographers' use is prepared by dissolving 3 or 4 grains of amber in 1 oz. of chloroform.

Besides the varieties of varnish already mentioned, numerous other preparations are used for specific purposes which can not well be classified under any of the above heads. A varnish consisting of 1 part gutta-percha dissolved in 5 parts oil of turpentine, to which 8 parts of hot linseed oil are added, does not scale, and is sometimes used for maps. Wax varnish, or milk of wax, is prepared by melting 1 lb. of white wax at a low heat, adding 1 pint of warm alcohol (90 per cent.), mixing, and pouring the liquid out on a cold porphyry slab, on which it is ground with a muller to a smooth paste. An emulsion with water is then made and strained through muslin. This preparation is extensively employed as a protective coating for old paintings, upon which it is first allowed to dry, and then equally fused by passing a warm iron over it. A varnish for covering zinc is obtained by dissolving equal parts of potassium chlorate and copper sulphate in hot water, and immersing the zinc in the solution for a few seconds; a coating of copper oxide is formed on the metal, which when dry is washed and polished, when it acquires an indigo-blue color. The preparations used for varnishing guns, engravings, leather, etc., differ little from those described above, although in the case of leather the article is usually dried in an oven after varnishing, the process being called JAPANNING (*q. v.*). Revised by IRA REMSEN.

* Japanese and Chinese lacquer-work is not included in this term. See LACQUER.

Varnish-tree: any one of the varnish-producing trees of the family *Anacardiaceæ*, especially the *Rhus vernicifera* of China and Japan, *Melanorrhœa usitata* of India, the *Stagmaria verniciflua* of the Malay islands, and the *Semecarpus anacardium* of Sylhet.

Varnum, JAMES MITCHELL: soldier; b. at Dracut, Mass., Dec. 17, 1748; graduated at Rhode Island College (now Brown University) in 1769; studied law, and practiced at East Greenwich, R. I.; in 1774 headed a company called the Kentish Guards, which gave to the army over thirty commissioned officers; rose to the rank of brigadier-general, and commanded the troops on the Delaware when the British took possession of Philadelphia; was with the army at Valley Forge in 1778; took part in the battle of Monmouth, and afterward served under La Fayette in Rhode Island, resigning from the army in 1779. He was member of Congress from Rhode Island 1780–82 and 1786–87, and in 1788 was appointed a judge of the Supreme Court of the Northwest Territory. D. at Marietta, O., Jan. 10, 1789.

Varo'li, COSTANZO: anatomist and surgeon; b. at Bologna in 1543; studied medicine at the university there, where he also taught anatomy for some time, but was invited to Rome by Pope Gregory XIII., and became his first physician. He made comprehensive investigations concerning the human brain, of which one part still bears his name, *pons Varolii*, and wrote *De Nervis Opticis, non-nullisque aliis, præter communem Opinionem in Humano Capite observatis* (1573), and *De Resolutione Corporis humani*, first published in 1591. D. in Rome in 1575.
Revised by S. T. ARMSTRONG.

Varota'ri, ALESSANDRO: commonly called IL PADOVANINO; painter; b. at Padua, Italy, in 1590; the son of Dario Varotari, also a painter. Alessandro lost his father at an early age and went to Venice, where he studied the works of Titian and Veronese, and painted in their manner. He went to Rome later, but spent most of his life in Venice and in Padua, where most of his paintings still exist. D. in 1650. Varotari was a most successful painter of children; his landscapes also are excellent. He painted frescoes in the Church of Sant' Andrea, at Bergamo. The *Marriage of Cana*, in the Academy at Venice, is considered his masterpiece. The National Gallery in London possesses two examples of his art; the Louvre only a drawing. See Ridolfi, *Le Maraviglie dell' Arte* (Venice, 1648); Orlandi, *Abecedario Pittorico* (Bologna; 1719), and Lanzi, *Storia Pittorica*. W. J. STILLMAN.

Varro, MARCUS TERENTIUS: author; b. B. C. 116 at the Sabine town of Reate, of an ancient family, probably of equestrian rank. He early devoted himself to antiquarian lore and to literature, but did not neglect his duties toward the state, and was often employed by Pompey on grave political occasions. When the civil war arose he espoused the republican cause, but was reconciled to the victorious Cæsar, who made him librarian of his contemplated collection. He was a prolific writer, and versatile as well in matter as in form. Though a devoted patriot, he availed himself of Greek culture, but in style he always remained uncouth and harsh. He was older than Cicero, who, with sentiments of admiration and fear, dedicated his *Academica* to him. He was styled by Cicero *homo πολυγραφώτατος*, and by Quintilian *vir Romanorum eruditissimus*; he was a great favorite with the Christian Fathers, and especially with St. Augustine. His writings amounted to 74 different works in 620 books, of which 170 were in metrical form, if we include the *Saturæ Menippeæ* (150 books), so-called after Menippus, the cynic philosopher of Gadara. These latter, however, are a medley of prose and verse, treating a great variety of subjects, from philosophy to the commonest events of daily life, with much polemic and shrewd humor. His prose works embraced almost all branches of knowledge—grammar, rhetoric, geography, history, philosophy, jurisprudence, husbandry—but in his universal study he kept Rome and Roman interests always in view, and thus exerted an immense influence on his own and on subsequent times. D. B. C. 27. Of his works only two have been preserved: *De Lingua Latina* and *Rerum Rusticarum Libri III.* Of his 25 books on the Latin language only books 5–10 are extant, and these imperfect. His three books on husbandry we have complete, with the exception of a gap at the beginning of the second; this treatise is given in the form of a dialogue, like Cicero's philosophical writings, but with far more spirit and vigor. The other works of Varro do not appear to have been in existence beyond 600 A. D. Best

edition of the *De Lingua Latina* by Spengel (Berlin, 1885); of the *Rerum Rusticarum Libri III.* by H. Keil (Leipzig, 1884; commentary, 1891); of the *Saturæ Menippeæ* by Buecheler, with Petronius (Berlin, 1882). For other literature on Varro, see Teuffel's *Geschichte der römischen Litteratur*, §§ 164–169. Revised by M. WARREN.

Varro, PUBLIUS TERENTIUS: author; called ATACINUS, from the river Atax (now Aude), in Gallia Narbonensis, where he was born in 82 B. C. D. in 37. Besides satires and an epic poem with an historical subject entitled *Bellum Sequanicum*, he also made a translation of the *Argonautica* of Apollonius. For the few fragments, see Baehrens, *Fragmenta Poet. Rom.* (Leipzig, 1886). M. W.

Varus, PUBLIUS QUINTILIUS: Roman general, consul in 13 B. C., and afterward governor of Syria. In 7 A. D. he was made governor of the territory between the Rhine and the Elbe, which had been conquered by Drusus and Tiberius. The conquest was but superficial, however, and in the year 9 A. D. a secret insurrection against the Roman power was organized under the leadership of Arminius. Varus, with the Roman army, was lured into an ambuscade in the Teutoburg forest, and suffered total defeat, the leader, in despair, committing suicide. It was the greatest calamity of Augustus's reign, and the first time that Roman arms retreated from territory which they had once occupied. The region was never reconquered. G. L. HENDRICKSON.

Vasa, House of: a Swedish royal family. It came to the throne of Sweden in the person of Gustav Ericsson Vasa in 1523, and until 1654 ruled in the direct line. In that year the succession passed into a collateral female branch, and the same thing occurred in 1718, and again in 1751. On the death of Charles XIII. (1818) the house of Vasa ceased to reign, and Marshal Bernadotte came to the throne, though there was an heir, Prince Gustav of Vasa (1799–1877), the son of Gustavus IV. Adolphus, who was deposed in 1809. The most celebrated members of the family were Gustavus Adolphus and Charles XII. Queen Christina and Gustavus III. were also interesting characters, if not great, and Charles IX., X., and XI., as well as the founder, were very energetic and able rulers. Eric XIV. was mad; the Polish branch of the family was controlled by the Jesuits; and the last two rulers, Gustavus IV. Adolphus and Charles XIII., were weak-minded. See, further, the biographies under the separate headings. Revised by F. M. COLBY.

Vásárhely (full name, **Hód-Mezö-Vásárhely**, hōd'mezö-vaa'shăăr'hāl', to distinguish it from Maros-Vásárhely, in Transylvania): city; in the county of Csongrád, Hungary; on the Hód Lake; station of the Alföld-Fiume Railway. The city is rapidly improving, and has many noteworthy public buildings, among them numerous churches, a Protestant gymnasium, a royal law court, and a town-hall, besides two banks, two hospitals, large breweries, and an oil-factory. It has a flourishing trade in the products of the fertile country surrounding it—wheat, grain, barley, oats, maize, fruits, white and red wine. Cattle and horses of the best breeds in Hungary are extensively raised. In spite of enormous dikes, the city frequently suffers from the inundations of the river Theiss. Pop. (1890) 55,475, mostly Magyars and Roumanians. HERMANN SCHOENFELD.

Vásárhely, Maros- (Germ. *Neumarkt*): chief town of the Szeklers, and capital of the county of Maros-Torda, Transylvania; on the left bank of the Maros river, and on the Kocsárd-Maros railway-line. It is the seat of the court of appeals for Transylvania, has a vast castle, containing barracks and the great reformed church, a reformed gymnasium, and a public library with a museum of natural history. Pop. (1890) 14,212. H. S.

Vasa'ri, GIORGIO: painter, architect, and biographer; b. at Arezzo, Italy, July 30, 1511, of a family of artists. He first studied under Guglielmo da Marsiglia, then went to Luca Signorelli, who was related to him; then to Andrea del Sarto and Michelangelo. In his early years he became discouraged, gave up painting for a time, and went to Florence, where he turned his attention to the goldsmith's art, but commissions at Pisa led him back to painting. He then worked at Arezzo. After this Cardinal Ippolito de' Medici took him under his protection and gave him opportunities for studying drawing and letters under the instruction of Ippolito and Alessandro de' Medici. In 1529 he went to Rome, where he worked, together with his intimate friend Salviati (see ROSSI, FRANCESCO, de'), at drawing ancient monuments with such assiduity that he fell ill of fever, and had to return to his native city. After decorating a room in the Palazzo Medici that Giovanni da Udine had begun, he turned his attention to architecture, and soon became one of the most accomplished of his time in that department. On the death of his protectors, the Medici, he retired from the court, and was commissioned to paint frescoes at the Certosa, and also for the Olevetan, in Rimini and Bologna, and for the Santi Apostoli in Florence. He became famous, and commissions came to him from every part of Italy. His friend Pietro Aretino invited him to Venice, where he painted important works for the great patricians there. In 1542 he returned to Tuscany, and thence to Rome, where Michelangelo became his friend, and procured commissions from the cardinals and the pope for him, recommending him as an artist of the highest merit. He also worked in Naples for a year, but left incomplete works there, being driven away by the envy of his fellow artists. It was in Rome, while painting the scenes from the life of Paul III. in the Sala della Cancelleria of the Vatican, that he became known to Paolo Giovio, who seems to have suggested to him the writing of the work (*Lives of the Painters, etc.*) to which he chiefly owes his fame. Its full title is *Delle Vite de' più Eccellenti Pittori, Scultori, ed Architetti.* The first edition was published in 1550. The standard edition is by Milanesi (1878–85). Many of the anecdotes it contained gave offense to artists who were still living, as also his criticisms of their work. He modified these judgments and suppressed the offensive parts in the second edition. Vasari was also the originator of the Florentine Academy, which was founded about 1561. D. in Florence, June 27, 1574. He was at the time painting the cupola of the cathedral, which he left incomplete. Besides his *Lives* he wrote several treatises on the fine arts. Vasari's paintings suffered from too facile and hasty execution, and from his employment of incompetent assistants. W. J. STILLMAN.

Vasco da Gama: See GAMA, VASCO, da.

Vasconcel'los, JOAQUIM ANTONIO FONSECA, de: scholar; b. at Oporto, Portugal, Feb. 10, 1849. He received most of his earlier education at Hamburg, then pursued his university studies at Coimbra (1865–69). From 1871 to 1875 he traveled extensively in Germany, France, England, Spain, and Portugal. In 1883 he became Professor of German in the College of Oporto, and in 1889 he was also made director of the Museum of Trade and Industry in that city. His German education and his extensive knowledge of the world early put him out of sympathy with the intellectual superficiality of his countrymen, and in his organ, *A Actualidade* (The Present), he has steadily striven by criticism and admonition to give Portuguese scholarship the solidity and scientific accuracy demanded by the best ideals of the present. His own most important work as a scholar has been in the field of the history of art, and falls into two main parts, one dealing with music, the other with the other fine arts. To the first belong *Os musicos portuguezes: Biographia-bibliographia* (Oporto, 1870); *Luiza Todi* (1873); *Ensaio sobre o catalogo da libraria de musica de el-rei D. João IV.* (1873); *Cartas curiosas do abbade Antonio da Costa* (1879). To the second group of works belong *Reforma do ensino de bellas artes* (3 vols., 1877–79); *Albrecht Dürer e a sua influencia na peninsula* (1879); *Francisco de Hollanda* (1879); *Goësiana* (4 vols., 1879–81). Besides these contributions to science, Vasconcellos has done much to spread a knowledge of German literature in Portugal. Here may be mentioned two works occasioned by the free and inaccurate translation of Goethe's *Faust* by Castilho: *O Faust de Goethe e a tradução de Castilho* (1872), and *O consummado germanista* (1879).—His wife, KAROLINA WILHELMA MICHAELIS DE VASCONCELLOS, was born in Berlin, Mar. 15, 1851, and married him in 1876. The daughter of Prof. Gustav Michaelis, a well-known authority on stenography and the physiology of sound, she received an extensive linguistic and literary education at the Luisenschule at Berlin, under Mätzner and Goldbeck. She was early attracted by the languages and literatures of the Spanish Peninsula, and her investigations in this field have placed her among the first Romance philologists of the present day. Her first publication was a collection of the Spanish ballads dealing with the Cid, *Romancero del Cid* (Leipzig, 1870). Of her later works may be cited *Studien zur romanischen Wortschöpfung* (Leipzig, 1876); *Ein portugiesisches Weihnachts-Auto: Pratica de tres pastores* (Brunswick, 1879); *Versuch über den Palmeirim da Inglaterra* (Halle, 1883); *Poesias de Francisco de Sa de Miranda* (Halle, 1885); *Studien zur*

hispanischen Wortdeutung (Florence, 1886); and the admirable survey of Portuguese literature in Gröber's *Grundriss der romanischen Philologie*, vol. ii. To the list should be added numerous contributions in the *Revista lusitana*, *Zeitschrift für romanische Philologie*, *Romanische Forschungen*, and other learned journals. A. R. MARSH.

Vasconcellos, SIMÃO, de: missionary and historian; b. at Coimbra, Portugal, in 1599. He entered the Jesuit order, was sent, about 1630, to Brazil, and passed the remainder of his life teaching in the colleges or laboring among the Indians. Vasconcellos published *Cronica da companhia de Jesus no Brazil* (1663; 2d ed. 1864); *Lives* of Anchieta and Almeida, etc. These books are well written, and are considered among the most important of the early works on Brazil, both for secular and for ecclesiastical history. D. in São Paulo about 1670. H. H. S.

Vascular Tissue: in plants, the fibro-vascular system, composed of vessels and ducts. See HISTOLOGY, VEGETABLE.

Vasey, GEORGE, A. M., M. D.: botanist; b. near Scarborough, England, Feb. 28, 1822. His family removed to the U. S. when he was an infant; he was educated in the schools of Oneida co., N. Y., the Oneida Institute, and the Berkshire Medical Institute in Pittsfield, Mass.; practiced medicine in Elgin, and Ringwood, Ill., from 1848 to 1866; botanist of Maj. John W. Powell's Colorado expedition 1868; editor, with Charles V. Riley, of *The American Entomologist and Botanist* (1869–70); botanist of the Department of Agriculture, Washington, D. C., 1872 to 1893. D. in Washington, D. C., Mar. 4, 1893. His publications relate largely to the grasses, to the study of which he devoted himself almost exclusively during the last fifteen years of his life. The more important are *A Catalogue of the Forest Trees of the United States* (1876); *Gramineæ* in Lieut. George M. Wheeler's *Report* (1877); *A Synopsis of the Tribes and Genera of the Grasses of the United States* (1883); *Agricultural Grasses of the United States* (1884; revised in 1889); *A Descriptive Catalogue of the Grasses of the United States* (1885); *Grasses of the Southwest* (part i. 1890, part ii. 1891); *Grasses of the Pacific Slope* (part i. 1892, part ii. 1893); *Monograph of the Grasses of the United States and British America* (1892, unfinished).
CHARLES E. BESSEY.

Vasquez de Coronado, vaăs'kāth-dā-kō-rō-naa'dō, FRANCISCO: explorer of New Mexico; b. at Salamanca, Spain, about 1500. He went to Mexico, probably with Viceroy Mendoza in 1535, and in 1539 was appointed governor of Nueva Galicia, then embracing all of Northwestern Mexico, with an indefinite extension northward. At this time extravagant ideas were current about the "seven cities" of Cibola (the Indian pueblos of Arizona) reported by Cabeza de Vaca and seen by NIZA (*q. v.*). Coronado organized an expedition for their conquest. He left Culiacan in Apr., 1540, with 300 soldiers and 800 Indians, taking Niza as a guide. Crossing the deserts he reached the Cibola pueblos, but found none of the riches reported by Niza. He then turned eastward, exploring the region now called New Mexico, and possibly penetrating to Kansas; but he was everywhere disappointed in his search for gold, and a large part of his force perished in the desert. He returned in Mar., 1542, and was employed in quelling the Culiacan revolt, but died not long after. See *The Gilded Man*, by Adolphe F. Bandelier (New York, 1893). HERBERT H. SMITH.

Vasquez de Coronado, JUAN: administrator; b. at Salamanca, Spain, about 1525. He was of an illustrious family, and married a relative of Pedrarias, the governor of Panama. After studying law in the University of Salamanca, he went to Guatemala in 1550, and the *audiencia* of the Confines employed him in various important posts. He was *alcalde mayor* of San Salvador and Honduras, and later of Nicaragua; *alcalde ordinario* of the city of Guatemala; and in Apr., 1562, was named *alcalde mayor* of the provinces of Cartago and Costa Rica. He carried a large amount of supplies to the impoverished settlers of those regions; quickly reduced his territory to order, conciliating the Indians by his kindness and justice; and after thoroughly exploring Costa Rica and founding Cartago and other towns, he returned to Spain in 1564. It was adjudged that he had effected the pacification of Costa Rica, and he was appointed captain-general of that country for life and in heredity, as well as governor of Nicaragua for three years. He set out for his domain with a large retinue, but was shipwrecked and drowned in Oct., 1565. HERBERT H. SMITH.

Vas'salboro: town; Kennebec co., Me.; on the Kennebec river, and the Maine Cent. Railroad; 12 miles N. by E. of Augusta (for location, see map of Maine, ref. 8–C). It was settled in 1760, incorporated in 1771, and had part of its territory taken to form the town of Sidney in 1792. It contains the villages of Vassalboro, East Vassalboro, South Vassalboro, North Vassalboro, Riverside, and Cross Hill; and has nine churches, Oak Grove Seminary, and a commercial college. Pop. (1880) 2,621; (1890) 2,052; (1900) 2,062.

Vassar: village; Tuscola co., Mich.; on the Cass river, and the Flint and Pere Marq. and the Mich. Cent. railways; 23 miles S. E. of Bay City, and 27 miles N. W. of Lapeer (for location, see map of Michigan, ref. 6–K). It is in an agricultural and lumbering region, and has a national bank with capital of $50,000, a private bank, a public high school, a weekly newspaper, several flour and lumber mills, foundries and machine-shops, woolen-mill, and other manufactories. Pop. (1880) 670; (1890) 1,682; (1900) 1,832.

Vassar, MATTHEW: b. at East Dereham, Norfolk, England, Apr. 29, 1792; was taken to the U. S. in 1796 with his father, who settled on a farm near Poughkeepsie, N. Y., and carried on an extensive brewery, acquiring a fortune in that business. D. at Poughkeepsie, June 23, 1868. He was a Baptist, and contributed richly to the churches of that denomination, and founded and endowed VASSAR COLLEGE (*q. v.*).

Vassar, MATTHEW, Jr.: philanthropist; nephew of the founder of Vassar College; b. at Poughkeepsie, N. Y., May 11, 1809; educated in the common schools; treasurer and trustee of Vassar College from its beginning to his death. He, with his brother John Guy, erected the Vassar brothers' laboratory, for Vassar College, at a cost of $20,000, also the Vassar old men's home in Poughkeepsie. He held many local and important offices in his native city, and was a man of great shrewdness and activity. He left nearly $400,000 to be distributed among various institutions, corporations, and societies, of which $85,000 was for a hospital in Poughkeepsie, to be called Vassar Brothers' Hospital. D. at Poughkeepsie, Aug. 10, 1881.—His brother, JOHN GUY VASSAR (b. at Poughkeepsie, N. Y., June 13, 1811; d. there Oct. 27, 1888) gave to the college a fine building for literary and scientific purposes. Ill health prevented steady application to business, and he traveled extensively. He published *Twenty Years around the World* (New York, 1861; 2d ed. 1862). Revised by S. M. JACKSON.

Vassar College: an institution at Poughkeepsie, N. Y.; founded by Matthew Vassar in 1861, and opened to students in 1865. It was the first amply endowed and adequately organized college for women. The original gift was $428,000, expended for buildings and other equipments. This was supplemented by a bequest of $360,000. Matthew Vassar, Jr., subsequently left to the college $130,000, and from the estate of John Guy Vassar it received $444,000. By other gifts the endowment fund has reached the sum of $1,020,000 (1894). The buildings, collections, and apparatus are valued at $1,000,000 more. The buildings include three for residence, library, laboratories, museum and art gallery, gymnasium, conservatory, professors' residences, etc. The main building, which is 500 feet in length, is modeled after the Tuileries. The buildings are located in the midst of 210 acres of land, much of which is laid out as a park. It is 3 miles from the Hudson, and is connected with the river by an electric railway.

There are nineteen professorships, about equally divided between men and women, and twenty-six other officers and instructors. The course of study is similar to that of the best colleges in the U. S., and the requirements for admission are equal to theirs. No one is admitted, even for a special course, unless on the full requirements in force for the regular course. Lectures by specialists from other institutions supplement the work of the departments. The degree of A. B. is given on the completion of a four years' course, of which the first year and part of the second are prescribed, and the remainder, excepting a course in philosophy, is elective. The A. M. degree has never been given save on examination. One year of resident work, or two of non-resident, is requisite. There are several fellowships for graduate work. Music and painting are provided for, but the practice of these arts is not included in the work counted for a degree. The science and history of the arts are included in the curriculum. The college is non-sectarian. Its services of worship are conducted by the president and preachers of various denominations. The number of students in 1900 was 700. JAMES M. TAYLOR.

Vassilkov': a town in the government of Kiev, Little Russia; on the Stugna, near its junction with the Dnieper; has tobacco and soap factories. Pop. 18,000, mostly engaged in agricultural pursuits.

Vasto (ancient *Histonium*): fortified town; in the province of Chieti, Italy; about a mile from the Adriatic, in the plain known as the Piano d'Aragona, connected by rail with Brindisi and Bologna (see map of Italy, ref. 5–F). The principal industries are olive-culture and the manufacture of earthenware, woolen cloth, and silk. Pop. 9,800.

Vater, faa'ter, JOHANN SEVERIN: theologian and philologist; b. at Altenburg, duchy of Saxe-Altenburg, Germany, May 27, 1771; studied theology and languages at Jena and Halle; was appointed Professor of Theology and Oriental Languages at Jena in 1796, at Halle in 1800, at Königsberg in 1809, and returned in 1820 to Halle. He published *Synchronistische Tafeln der Kirchengeschichte* (Halle, 1809; 6th ed. 1833; Eng. trans. by F. Cunningham, *Tables of Ecclesiatical History*, Boston, 1831). In his day he was widely known by his grammars of the Hebrew (1797), Polish (1807), and Russian languages (1809); his *Handbuch der hebräischen, syrischen, chaldäischen und arabischen Grammatik* (1801); his continuation of Adelung's *Mithridates* (1806–17); his *Literatur der Grammatiken, Lexika und Wörtersammlungen aller Sprachen der Erde* (1815); and by his commentary on the Pentateuch (2 vols., 1802–05). D. at Halle, Mar. 16, 1826. Revised by S. M. JACKSON.

Vatican Codex: See CODEX VATICANUS.

Vatican Council [*Vatican* is from Lat. *Vatica'nus* (sc. *mons* or *collis*, hill), the Vatican Hill on the west bank of the Tiber, at Rome]: the twentieth œcumenical council of the Roman Catholic Church, deriving its name from the Vatican Basilica (St. Peter's), in Rome, where it was held. It was called by Pope Pius IX., through the encyclical *Æterni Patris Unigenitus Filius*, under date of June 29, 1868, and solemnly opened Dec. 8, 1869. In consequence of the Franco-German war and of the occupation of Rome by the Italian troops, the council was suspended Oct. 20, 1870. It has never been reconvened, nor has any œcumenical council been held since. The number of prelates who took part in the conciliar proceedings varied considerably. It was largest in the fourth general congregation (Dec. 28, 1869), when 727 were present; ranged subsequently between 500 and 650; and fell in the eighty-seventh congregation (Aug. 13, 1870) to 136. In the eighty-ninth and last (Sept. 1, 1870) only 104 members were present.

The subject-matter of the council had been arranged beforehand in *schemata*, which served as the basis of discussion. Each of the fathers received a copy of the *schema* wrote upon it such comments as he thought necessary, and sent it thus annotated to one of the four commissions (*deputationes*) especially charged to deal with questions concerning respectively faith, discipline, religious orders, and Oriental rites. Each commission consisted of twenty-four prelates, chosen by members of the council, and a cardinal president, appointed by the pope. The commission having modified the schema along the lines suggested by the fathers, issued the *schema reformatum* and submitted it for discussion in the general congregation. Here it was further modified, adopted, and formulated in decrees or canons. These were finally voted upon and solemnly promulgated in the public sessions, at which the pope presided. The deliberations of the council resulted in two constitutions. The first, on *Catholic Faith*, was promulgated in the third public session, Apr. 24, 1870. It embodies the doctrine of the Church concerning God the Creator, revelation, the nature of faith, and the relations between faith and reason. The positive statements on these points are followed by a series of "canons," in which errors regarding the same matters are condemned. The other constitution, on *The Church of Christ*, was promulgated in the fourth and last public session, July 18, 1870. It defines the primacy and infallibility of the Roman pontiff. (See INFALLIBILITY OF THE POPE.) These decrees occasioned considerable agitation both in political and in ecclesiastical circles. A number of prominent Catholics in Germany, with Döllinger at their head, refused to accept the decision of the council, and formed themselves into a body known as Old Catholics. This movement was favored by the Government; but, as the bishops had been practically unanimous in voting for the decrees, and as those who were absent from the council or opposed its action professed their adhesion in course of time, no schism of consequence ensued.

LITERATURE.—1. By Catholics: *Acta et Decreta Sac. Conc. Recentiorum—Collectio Lacensis* (vol. vii., Freiburg, 1890)—this is the most complete collection of documents; Cecconi, *Storia del Concilio Ecumenico Vaticano* (Rome, 1872–78, 4 vols., incomplete); Fessler, *Das vaticanische Concil, dessen äussere Bedeutung und innerer Verlauf* (Vienna, 1871); Martin, *Die Arbeiten des V. Concils* (Paderborn, 1873); Cardinal Manning, *The True Story of the Vatican Council* (London, 1877). 2. By non-Catholics: Joh. Friedrich, *Documenta ad illustrandum Concilium Vaticanum* (Nördlingen, 1871) and *Geschichte des vaticanischen Concils* (3 vols., Bonn, 1877–87); Emil Friedberg, *Sammlung der Actenstücke zum ersten vaticanischen Concil* (Tübingen, 1872); Thos. Frommann, *Geschichte und Kritik des vaticanischen Concils* (Gotha, 1872); E. de Pressensé, *Le Concil du Vatican* (Paris, 1872); L. W. Bacon, *An Inside View of the Vatican Council* (New York, 1872). For two remarkable discussions regarding the council, see (1) Döllinger's *Janus* (Leipzig, 1869); Hergenröther, *Anti-janus* (Freiburg, 1870); and Friedrich, *Neubearbeitung des Janus* (Munich, 1892); (2) Gladstone, *The Vatican Decrees in their Bearing on Civil Allegiance*, with the replies of Archbishop Manning and Lord Acton (New York, 1874).

J. J. KEANE.

Vatican Palace: properly the pontifical palace of the Vatican, the well-known palace of the popes and their official residence since the fifteenth century. The Vatican Hill was not included in the ancient city of Rome, and the earliest wall that inclosed it was built under Pope Leo IV. about 850 A. D. Before that time the popes had a villa on this site because of its nearness to the Basilica of St. Peter. Their official residence was the Lateran Palace. When Gregory XI. (1370–78) returned to Rome from Avignon the Lateran was in a ruinous condition, and since then the Vatican has generally been the papal residence proper. Under Nicholas V. (1447–55) the rebuilding of the palace began in a serious fashion and on a large scale. Paul II. (1464–71) began the three-story buildings surrounding the court of S. Damaso and called the *loggie* of Bramante or of Raphael. Sixtus IV. (1471–84) built the Sistine chapel. Innocent VIII. (1484–92) began the court of the Belvedere. Alexander VI. (1492–1503) built many chambers and galleries, and either built or finished the covered passage which leads over the house-tops to the castle of Sant' Angelo. Julius II. (1503–13) finished the court of S. Damaso, and connected it with the distant court of the Belvedere by the long galleries which are now used for the museums. Paul III. (1534–49) built the Pauline chapel (Cappella Paolina) and the Sala Regia, which leads to it. Gregory XIII. (1572–85) continued the long galleries of Julius II. The buildings to the E. and S. of the court of S. Damaso which come close to the great colonnades that inclose the open place in front of St. Peter's church are the work of later popes, not having been finished until the reign of Pius IX. (1846–78). The well-known Braccio Nuovo, which connects the long galleries of the museum, and contains itself some of the most important sculptures, was built under Pius VII. (1800–23). The entire mass of buildings, inclosing and fronting on twenty different courts and roughly computed to contain 11,000 rooms, has no exterior architectural effect, but seems an accidental gathering of buildings of different characters. It contains, however, much architectural display in the buildings on the courts and in the interiors of halls and galleries, and is particularly noted for the wall-paintings, such as those by Perugino, Signorelli, Botticelli, Rosselli, Ghirlandajo, and Michelangelo in the Sistine chapel; those by Raphael and his pupils in the so-called Stanze di Raffaello; and by Giovanni da Udine and by Raphael himself and his other pupils in the *loggie* on the court of S. Damaso. The palace contains the largest collection of classical statuary in Europe, although most of the pieces are Roman copies of Greek originals. There is an Etruscan museum of great interest and a small Egyptian museum. The picture gallery contains few works, although they are of great importance. The tapestries in the Galleria degli Arazzi are notable. Ancient maps of interest are contained in the Galleria Geografica. The library is famous for its magnificent collection of manuscripts and its rare early printed books. In connection with the library is an immense collection of gems and small objects of value, Christian antiquities, and objects of art presented to different popes by sovereigns and others. The papal manufactory of mosaic is also contained in the palace. RUSSELL STURGIS.

Vattel, Emmeric, de: jurist; b. at Couvet, Neuchâtel, Switzerland, Aug. 25, 1714; studied philosophy and theology at Basel and Geneva, a large part of his literary work being done at the former place. In 1741 he published *Défense du Système Leibnizien*; in 1743, after having vainly sought a public position from Frederick II. at Berlin (Neuchâtel being at that time a Prussian possession), he went to Dresden, where he received a position in the civil service of Saxony, and three years after was made minister to Berne by the elector Augustus III. While residing at Berne he devoted himself assiduously to the writing of philosophical and legal works, publishing, besides several minor works, *Mélanges de littérature, de Morale, et de Politique*; *Loisirs philosophiques*; and his celebrated book, *Droit des Gens, ou Principes de la Loi naturelle appliqués à la Conduite et aux Affairs des Nations et des Souverains* (2 vols., 1758; Eng. trans. 1760, and again by Joseph Chitty, with the title *Law of Nations, or Principles of the Law of Nature applied to the Conduct and Affairs of Nations and Sovereigns*, 1797; the second translation has been reprinted several times, both in England and the U. S). From Berne he returned to Dresden in 1758, where he became a privy councilor, but here his health failed and he was obliged to give up his duties in 1766. D. at Neuchâtel, Dec. 20, 1767. Vattel's last work was *Questions de Droit naturel, et Observations sur le Traité du Droit de la Nature par M. le Baron de Wolf* (Berne, 1762). Revised by F. Sturges Allen.

Vau, fow: the ancient Greek name of the sixth letter of the original alphabet, Gr. *Faῦ* or *βαῦ*. Its form *F* survives in the Latin F. On account of its shape it was sometimes called *digamma*, i. e. double *gamma* (Γ). After its sound *w* disappeared from the Ionic idiom, it was disused as a letter in the Ionic alphabet, which later became the standard alphabet of Greece, but it remained as a numeral sign (= 6), surviving in the form *ς* with the name *stigma*. B. I. W.

Vauban, vō'bäăn', Sébastien le Prestre, de: military engineer: b. at St.-Leger-de-Foucheret, near Saulieu, Burgundy, France, May 15, 1633; at the age of seventeen joined the Spanish troops under Condé on the Belgian border; was taken prisoner by the French in 1653, and enlisted in the French army; showed great skill as an engineer in the siege of Sainte-Menehould and other cities; was commissioned in 1655 *ingénieur du roi*; became governor of Lisle 1663, commissary-general of the fortifications of France 1678, governor of the maritime ports of Flanders 1689, marshal of France 1703. D. in Paris, Mar. 30, 1707. To his inventive genius is due the creation or perfection of the bastioned system of fortification, or that modification of mediæval forms which the invention of gunpowder and the perfecting of artillery imposed. Errard of Bois-le-Duc, the Chevalier Antoine de Ville, and the Comte de Pagan were his predecessors in this, Vauban following up principles suggested by Pagan, and putting them extensively into practice. He constructed thirty-three fortresses and repaired and improved about 100. He conducted fifty-three sieges, and shared in 140 battles and skirmishes; acquiring the fullest confidence of his sovereign, he attained, as marshal of France, the highest honor in the French army. Notwithstanding his eminence as an author and creator, almost, of the subsequent art of fortification, his success as engineer of sieges was even more marked. Engaged in the service of one of the most ambitious of monarchs, Louis XIV., it was on the offensive rather than the defensive that his services were called for. The inventor of parallels in sieges and of the ricochet fire, he developed that irresistible system of attack which has ever since been so successfully followed. He was eminent also as a civil engineer, and indeed the impress of his genius is still borne in the history of his country. Among other subjects not military to which he devoted himself, political economy may be mentioned. "Vauban," says Gen. Bardin, "has enjoyed an unparalleled fame; for a century and a half himself and his works have been the theme and study of Europe. Never before had engineer been able to obtain such consideration or to acquire so much experience." Allent (*Histoire du Corps du Génie*) affirms he wrote nothing on the tracé of fortifications; hence works thus attributed must be regarded rather as commentaries or exhibits by others of his methods. His principal military writings include *De l'Attaque et de la Défense des Places* (1736), and as *Œuvres militaires de Vauban* were edited by Gen. Latour Foissac (1796). He also left a work entitled *Mes Oisivetés*. See the *Notice historique sur Vauban*, by de Chambray (Paris, 1840).

Vaucanson, vō'kăăn'sōn', Jacques, de: mechanician, especially noted as an inventor of automatons; b. at Grenoble, department of Isère, France, Feb. 24, 1709; studied mechanics and anatomy for several years. His most famous works were his flute-player (1738), which played a flageolet with the left hand and beat a tambourine with the right, executing many pieces of music with wonderful accuracy; and a brass duck (1741), which could fly, quack, eat, and apparently digest and evacuate its bowels. Cardinal Fleury made him superintendent of silk manufactures, but his improvements on the machinery caused a riot among the workmen of Lyons; in order to avenge himself, he made an automaton ass which could weave flowered silks. His collection of automatons he bequeathed to the queen, but it subsequently became scattered. D. in Paris, Nov. 21, 1782.

Vaucluse, vō'klüz': department of Southeastern France, bordering W. on the Rhône and S. on the Durance. Area, 1,370 sq. miles. The eastern part is covered with spurs of the Alps; the western, along the Rhône, consists of low plains. The soil is not very fertile, and produces insufficient grain for home consumption. Wine and fruits are produced; bees and silkworms are extensively reared; some manufactures of silk, pottery, and chemicals are carried on. Pop. (1896) 236,313. Capital, Avignon.

Vaud, or **Pays-de-Vaud**, pā'ĕe-de-vō' (Germ. *Waadt*): canton of Switzerland; bordering S. on Lake Geneva and Valais, bounded N. by Neuchâtel, E. by Freiburg and Berne, and W. by France; area, 1,244 sq. miles. The surface is an elevated plateau between the Jura and the Bernese Alps, sloping S. toward Lake Geneva, N. toward Lake Neuchâtel. Near the mountains are regions of pasture-land where cattle-rearing and dairy-husbandry form the principal occupations; but the larger part of the plateau is under tillage and carefully cultivated. Wheat and wine are extensively produced, and the white wines of the canton are of superior quality. Salt mines in Bex are worked, and watches, music-boxes, and carved wood are manufactured to some extent. Along the north shores of Lake Geneva are numerous resorts that are frequented by foreigners. After the fall of the Roman empire the country belonged to the Burgundian kingdom, but in the thirteenth century it became a dependency of Savoy; and when the Duke of Savoy took part in the war between the Duke of Burgundy and the Swiss, in the fifteenth century, it was conquered by Berne. It became a part of Switzerland in 1803. Pop. (1900) 279,152, most of whom are Protestants and speak French. Capital, Lausanne. Revised by M. W. Harrington.

Vaudeville [believed to be from *Les Vaux de Vire*, two valleys in the Bocage of Normandy, where dwelt Olivier Basselin (*q. v.*) in the fifteenth century]: a name at first applied to satirical songs relating to current events, for the composition of which Olivier Basselin was famous. The name is now applied to a light kind of dramatic entertainment interspersed with music, and having humorous or satirical allusions to current topics of the day.

Vaudois: another name for the Waldenses. See Waldensian Church.

Vaudreuil, vō'drö*l*': the title of a French family, several members of which are notable. Philippe de Rigaud, Marquis de, b. in France about 1641; entered the military service; rose to be a brigadier-general; went to Canada in 1687; served in various expeditions against the Seneca, Onondaga, and Oneida Indians; was made governor of Montreal in 1698, and Governor-General of Canada in 1703. His administration was vigorous and successful; he put a check to the influence of the English in the West, and, although unable to prevent the loss of Acadia, succeeded in thwarting a formidable naval expedition sent against Quebec. D. in Quebec, Oct. 10, 1725.—Pierre de Rigaud, Marquis de, fifth son of Philip, b. in Quebec, Nov. 22, 1698; entered the French military service; was made governor of Three Rivers in 1733, of Louisiana in 1742, and, having in 1748 succeeded by the death of his brothers to his father's title, became in 1755 Governor-General of Canada. He made strenuous but unavailing efforts to avert the capture of Quebec by Wolfe, and afterward endeavored to recapture it; was successful in one engagement, but, receiving no support from the mother country, was obliged to capitulate. He returned to France, where an investigation was instituted, and his administration was fully justified. D. in Paris in 1764.—Louis Philippe de Rigaud, Marquis de, nephew of Pierre, b. at Rochefort, France, Oct. 28, 1724;

entered the French navy, and commanded vessels in several important actions, notably in that between d'Estaing and Byron off Granada in 1779, and that between de Grasse and Graves in Chesapeake Bay; in the action with Rodney, Apr. 12, 1782, he saved his own squadron of the French fleet, with which he succeeded in reaching Boston. Returning to France, he became a member of the States-General in 1789, and in October defended the royal family against the populace; made his escape to England during the Reign of Terror, but returned to France after its close. D. in Paris, Dec. 14, 1802. Revised by F. M. Colby.

Vaughan, vawn or vaw'an, Charles John, D.D.: preacher and author; b. at Leicester, England, in 1816; educated at Rugby under Dr. Arnold and at Trinity College, Cambridge, graduating as senior classic and chancellor's medalist in 1838; became a fellow of Trinity 1839; took orders in the Church of England; held the living of St. Martin's, Leicester (formerly his father's) 1841–44; was head master of Harrow School 1844–59, raising that institution from a comparatively low ebb to great prosperity; refused the bishopric of Rochester 1860; was vicar of Doncaster 1861–69; was made master of the Temple 1869, and chancellor of York Cathedral and chaplain in ordinary to the Queen; resigned the mastership of the Temple in 1894, retaining his place as dean of Llandaff, which he had held for a number of years in connection with his London charge; married a sister of Dean Arthur P. Stanley. He had a high reputation as a pulpit orator and as a commentator, chiefly upon the Pauline Epistles. His published sermons and expository discourses exceed forty volumes. D. Oct. 15, 1897.

Vaughan, Henry: poet; b. at Newton St. Bridget, Brecknockshire, South Wales, in 1621; studied at Jesus College, Oxford, but did not graduate; qualified himself for the practice of medicine in London; was imprisoned as a royalist during the civil war, after which he passed his remaining years at his native place, enjoying great repute as a physician. D. at Newton, Apr. 23, 1695. He called himself the Silurist, after the Silures, an ancient British tribe of South Wales. He was the author of *Poems, with the Tenth Satyre of Juvenal Englished* (1646); *Olor Iscanus, a Collection of some Select Poems and Translations* (1650); *Silex Scintillans, or Sacred Poems and Private Ejaculations* (2 parts, 1650–55); *The Mount of Olives, or Solitary Devotions* (1652); *Flores Solitudinis, or Certain Rare and Elegant Pieces* (1654); and *Thalia Rediviva, the Pastimes and Diversions of a Country Muse, in Divine Poems* (1678). Vaughan's sacred poems have a mystical quality, and the best known of them, *The Retreat*, has often been compared with Wordsworth's *Ode on the Intimations of Immortality*. A *Memoir* by Rev. H. F. Lyte appeared in 1847. Revised by H. A. Beers.

Vaughan, Herbert, D.D.: cardinal; b. at Gloucester, England, Apr. 15, 1832; educated at Stonyhurst College, Lancashire, Brugelette, Belgium, and at the Accademia dei Nobili Ecclesiastici in Rome; entered the priesthood, being ordained at Lucca Oct. 28, 1854; joined the Oblates of St. Charles at Bayswater, London. He was vice-president of St. Edmund's College, near Ware, for several years until 1862; founded St. Joseph's Missionary College at Mill Hill, Middlesex, 1869, and is still its president-general. He was elected Bishop of Salford, and consecrated Oct. 28, 1872; succeeded Cardinal Manning as Archbishop of Westminster, receiving the pallium Aug. 16, 1892; was called to Rome in Jan., 1893, to be created a cardinal. He has twice visited the U. S. in connection with his missionary work. He is the proprietor of *The Tablet* and of *The Dublin Review*; is prominent in temperance and rescue work, and is an eloquent preacher.

Vaughan, Robert, D. D.: preacher, editor, and author; b. in Wales in 1795: educated for the Independent ministry at Bristol College; was pastor of churches at Worcester and Kensington; Professor of Ancient and Modern History in London University 1830–42; president of, and Professor of Theology in, the Lancashire Independent College, Manchester, 1843–57; projected *The British Quarterly Review* as an organ of the Independents, and edited it 1845–65; preached at Uxbridge, at St. John's Wood, London, and at Torquay, where he died June 15, 1868. He was the author of *John de Wycliffe, D. D., a Monograph, with some Account of the Wycliffe MSS.* (1853), which was a revised edition of an earlier *Life* (2 vols., 1828); and a volume on *English Nonconformity* (1862). His principal work is *Revolutions in English History* (3 vols., 1859–63).

Vaughan, Sir William: poet and planter; b. at Golden Grove, Caermarthenshire, Wales, in 1577, brother of the first Earl of Carbery, the patron of Jeremy Taylor; educated at Oxford, where he graduated in law; became a physician about 1625; was the founder of a settlement called Cambriol in Newfoundland, and wrote the praises of that colony in a quaint tract in prose and verse called *The Golden Fleece, divided into Three Parts, etc., by Orpheus Junior* (1626), written apparently to attract emigrants, and notable as the first volume of original poetry written in the British North American colonies. Vaughan returned to England, and died about 1640. Revised by H. A. Beers.

Vault: a roof or ceiling built of solid units kept in place mutually on the principle of the arch. There is no difference except of extent between an arch and a vault, but the mere fact of greater extent causes the existence of varieties in the vault. Thus a cupola or dome is a vault, but is very different in character from an arch in an ordinary wall. It is common, however, to separate vaults from cupolas and to classify them in the following way: A *wagon vault* or *cradle vault* or *barrel vault* is a simple arch made broader and is called by these names because such an arch is usually semicircular in upright section. An arch opened in a two-foot wall is not considered a barrel vault, but a precisely similar arch carried through a ten-foot or twenty-foot bank, as when a culvert is built under a railway embankment, is such a vault. A *rampant vault* is a similar vault not on a level, but sloping upward, as when a roof is built over a staircase so as to carry another flight of stairs above. A groined vault is one made by the intersection of two barrel vaults; the solid angles made where the one semi-cylinder cuts the other are called groins, and it will be observed that these groins are right-angular at bottom if the two barrel vaults meet at right angles, and grow more and more obtuse as they approach the crown or summit of the vault.

The palaces of the Assyrians and other Eastern nations of antiquity were unquestionably vaulted, partly with cupolas, partly with half cupolas having large semicircular openings, either toward the north, much as our modern north lights are arranged for artists, or toward the quarter of the prevailing winds, and so acting like the modern Persian *badjeer* or our wind-sail; and partly with barrel vaults. These structures were built of brick and mortar, forming very solid and adherent masses. A similar construction was used a thousand years later by the Byzantine builders, but previous to this the constructors of the Roman empire must have learned from their Eastern neighbors the secret of one of their systems of vaulting, as explained below. The Etruscans more than any other nation of antiquity used a vault of shaped stones or voussoirs (see Arch), and the Roman builders followed them in this, but also used to a still greater extent the vault made of small irregular stones laid in a great abundance of mortar. It has been said that a vault is an enlargement of the arch, but when either the common arch or the vault is so firmly cemented together and so massive that it forms a solid and inelastic half ring, half cylinder, or, as it were, an inverted cup, it ceases to be either arch or vault in principle, while keeping its appearance and its name. Thus in the great basilica of Maxentius or of Constantine in Rome large parts of the vault have fallen, and are homogeneous masses of hardened mortar with small stones embedded in it. The vaults that still remain in place, six feet thick at the crown and equally homogeneous in material, can hardly be supposed to exercise any thrust horizontally or diagonally upon the walls which support them. The Romans used the cupola, the barrel vault, that modification of it called the rampant vault, another modification of it called the annular vault, which is the barrel vault carried on a rounded plan producing a ring-shaped surface, and finally the groined vault. This last, however, they used only when the two half cylinders intersecting one another were of equal radius. Whenever a narrower passage opened into a wider one or a hall, one of the half cylinders was kept so much lower than the other as to penetrate the vertical wall.

When the mediæval church-builders wished to vault their churches they were unable to imitate the immense solidity of the Roman imperial builders, and built their shell of vaulting of stones not larger than a man could handle, put together with mortar often poorly made and scanty. They were driven, therefore, to many expedients in the attempt to keep their vaults from falling. These experiments finally resulted in a vault carried on its own ribs—that is to say, a cage of arched ribs or narrow arches of cut stone, was built,

and the thin vaults of smaller stones rested upon these ribs. Every part of such a vault had a curved surface. Every square foot of its surface, in the upper part, where it approached the horizontal, was rounded up, and exercised a thrust upon all the ribs which supported it. The whole vault was very elastic, and would allow of some settlement or dislocation without falling. This vaulting was the great peculiarity of the Gothic style, all the character of that style coming, indeed, from the free use of these vaults and the necessary supports and counterpoises used to resist their thrust.

In modern times vaults are rarely used in northern countries, except in fortresses and the like; but in Italy and other Mediterranean countries they are still in use. Those now built are always of the Roman rather than the Gothic sort, without ribs and built in a solid and uniform shell. See also FIRE-PROOF BUILDING. RUSSELL STURGIS.

Vautier, vō'ti-ā', BENJAMIN: painter; b. at Morges, Switzerland, Apr. 24, 1829; studied painting at Düsseldorf 1850–51, and acquired celebrity as a genre-painter. Among his pictures are *Devout Singers in a Church* (1858); *The Spinning-woman* and *The Surprise* (1863); *A Sunday Afternoon in Suabia* and *Cats in a Criminal Case* (1864); *Wake in the Bernese Highlands* (1866); *The First Dancing Lesson* (1868); *A Village Funeral* (1871); *Alsatian Woman* (1882).

Vaux, vawks, CALVERT: landscape-architect; b. in London, England, Dec. 20, 1824; was educated at Merchant Taylors' School, London, then became an articled pupil of Lewis N. Cottingham, architect, London; went to the U. S. in 1850 as assistant to Andrew J. Downing, the landscape-gardener, who was at that time occupied with the Smithsonian grounds at Washington; was Mr. Downing's architectural partner at Newburgh, N. Y., until the latter's death, after which Mr. Vaux carried on the business. In 1857 he was engaged as architect for the Bank of New York, and settled in New York city. In partnership with Frederick L. Olmstead, Mr. Vaux made plans for Central Park, Riverside Park, and Morningside Park, New York city; Prospect Park, Brooklyn; parks at Chicago, Ill.; and Bridgeport, Conn.; the New York State reservation at Niagara Falls, and, in partnership with Samuel Parsons, Jr., made plans for Bryn Mawr College grounds, and for many country places of prominent men. Mr. Vaux was one of the architects for the first buildings for the Museum of Art in Central Park and the Museum of Natural History in Manhattan Square, New York city. He was a member of the consolidation inquiry commission of the Greater New York. As landscape-architect to the department of public parks of New York city he advanced the uncompleted design of Central Park by arranging extensions to the walk system in different parts of the park, and laid out the entire territory of Riverside Park between the drive and the river. Found drowned in Gravesend Bay, N. Y., Nov. 21, 1895. He was the author of *Villas and Cottages* (1860).

Vaux, RICHARD: See the Appendix.

Vaux, THOMAS, Lord: poet; b. at Harrowden, England, about 1510; educated at Cambridge; attended Cardinal Wolsey in his embassy to Charles V. 1527; succeeded to the title, and took his seat in the House of 1530; accompanied Henry VIII. to Calais and Boulogne 1532; became a Knight of the Bath and governor of the island of Jersey 1533. He was the author of a number of admired poems in the collection called *The Paradise of Daynty Devises* (1576), of which the best are entitled *The Assault of Cupid* and *The Aged Lover renounceth Love*, first published in Tottel's *Miscellany of Songs and Sonnets* (1557). D. in Oct., 1556.

Revised by H. A. BEERS.

Vecellio, TIZIANO: See TITIAN.

Vector: See IMAGINARY QUANTITIES and QUATERNIONS.

Veda: See SANSKRIT LITERATURE.

Vedānta, vā-daan'tăă: the most orthodox of the six orthodox Brahmanical philosophies. (See SĀNKHYA, YOGA, NYĀYA PHILOSOPHY, VAIÇESHIKA PHILOSOPHY, and MĪMĀṄSĀ.) Vedānta signifies properly the end (*anta*) or conclusion of the Veda, and is used (1) in this sense to denote an Upanishad which forms the end of a Vedic text; and (2) to denote the theologico-philosophical system which is founded on the Upanishads and appeals to them as "scripture" or "revelation" (*çruti*). These Upanishads, the oldest of which date from ante-Buddhistic times, contain a disorderly mass of speculation upon ritualistic, theological, cosmogonical, and other questions; and the course of thought in them is often obscure and contradictory. Their principal object, the one to which all others are subordinate, is the inquiry after the One Eternal, the Atman, or Brahman. The word *ātman* means originally breath, then principle of life, the innermost self, the soul. The ancient and venerable Upanishad called *Bṛhad-āraṇyaka* contains a legend representing the Atman as a mythological primeval being from which, in due order, all creatures proceed. But the idea of the Atman soon becomes dissociated from these rude conceptions, and the word *ātman* comes to mean the One Imperishable, the All-soul, or the Soul of the Universe. The word *brahman*, on the other hand, signified first devotion, prayer; then the power residing in prayer and all other sacred work; and finally the primeval, eternal, and infinite power which is the root of all existence. Having reached this point in the development of its meaning, this pregnant and momentous word *brahman* came to be completely identified with *ātman*. The originally objective Brahman became fused with the originally subjective Atman into one supreme metaphysical conception. By manifold likenesses the Upanishads endeavor to describe the nature of Brahman; but these endeavors culminate in the proposition that the innermost self of the individual is identical with that primeval and all-pervading power, a proposition which finds expression in the sentence, "That art thou"—*tat tvam asi*. Here, then, we have already the doctrine of the unity of the subject and the object.

This idealistic monism of the older Upanishads is methodically worked out and philosophically established in the Vedānta system proper. The origin of the Vedānta as a system is, in all probability, to be referred to the beginning of our era. Its reputed founder, or rather the first teacher who embodied the system in a fixed literary form of expression, was Bādarāyaṇa; and his Sūtra or compendium of the system is called the Brahma-sūtra or the Vedānta-sūtra, or the Brahma-mīmāṅsā or Çārīraka-mīmāṅsā—that is, the investigation concerning the Brahman or its embodiment. This compendium, like those of the other philosophical systems of India, is in the form of terse aphorisms, in themselves almost or quite unintelligible, so that we have to depend upon the native commentator for an accurate knowledge of the system. The most important among the expositors of the Brahma-sūtra is the exegete Çaṁkara (written also Shankara), who lived about 800 A. D. His greatest work is his Çārīraka-bhāshya or commentary on the Brahma-sūtra; but he wrote numerous commentaries on the Upanishads, as well as independent works on the Vedānta. It is highly probable, upon internal evidence, that Çaṁkara's expositions agree in all essential points with the system as intended by Bādarāyaṇa in his compendium. About three-quarters of the adherents of the Vedānta system in India to-day follow Çaṁkara in his interpretation of the system; while the remaining quarter are divided in their allegiance, and accept—some one, and some another—the various divergent views of the other commentators. Bādarāyaṇa's Sūtra, with Çaṁkara's commentary entire, has been translated into German by Paul Deussen (Leipzig, 1887); and an English version of the greater part has been published by Georg Thibaut as vols. xxxiv. and xxxviii. of Max Müller's *Sacred Books of the East*. Deussen has also given us an exhaustive and admirable systematic treatise upon the Vedānta from Çaṁkara's point of view in his *Das System des Vedanta* (Leipzig, 1883). The Sanskrit text of the Brahma-sūtra was published with Çaṁkara's commentary in the *Bibliotheca Indica* (Calcutta, 1848–74), and also in Bombay (1888).

The Vedānta, like all the philosophical systems of India, has for its object the release of the soul from the bonds of corporeal existence and the teaching of the means of escape from the distressful round of rebirth. Since the seventh century before Christ, all Aryan India, with the exception of the materialists or Chārvākas, has been under the influence of the general belief in the transmigration of souls (*saṁsāra*), and in the after-effect of deeds in one existence as determining destiny in another (*karma*). This conviction, that each individual after death will be again and again reborn to a new existence in which he enjoys the rewards of previously accumulated merit and suffers the consequences of previous misdeeds, is a fundamental factor of Indic pessimism. According to the Vedānta, the only release (*mukti* or *moksha*) from this endless round of birth and death is to be won by the attainment of knowledge or *jñāna*.

The fundamental dogma of the Vedānta system, according to the teaching of the Upanishads, is this: That our

self is absolutely identical with Brahman. Now Brahman is eternal and infinite. But since everything which consists of parts or which is susceptible to change is transitory, therefore it is impossible that Brahman should consist of parts or suffer change. From this it follows that every one in his innermost essence must be, not a part of Brahman, but the whole indivisible Brahman. Any other reality than this there is not; and accordingly the contents of the Vedānta system as interpreted by Çaṁkara are often comprehended in the expression *a-dvāita-vāda* or doctrine of non-duality; and Brahman is said to be one only, without a second (*ekam eva, a-dvitīyam*).

But how, then, is the contradiction which common experience and the traditional belief in metempsychosis and karma arouse against the doctrine of this "Brahman without a second" to be laid? The Vedānta answers: Experience and traditional belief result from ignorance (*a-vidyā*), which is native to every one, and which hinders the soul from discriminating its very self from the body and the bodily organs, and from recognizing the empirical world as an illusion (*māyā*). In truth, the whole world of phenomena is a downright illusion; it may be likened to a mirage, which vanishes upon closer inspection; or to a vision, which seems real only to the sleeper, but no longer seems real to him when awakened. The ever-shifting forms that surround us are a figment of ignorance; there is only one thing in the universe that is not under this power of illusion, and that is our self, the soul. This self, indeed, can not be demonstrated; but it requires no demonstration, for it is itself the basis of the activity of demonstrating, and is accordingly already established before one sets about the work of establishing it. And it is also not to be denied, because whoever denies it, *eo ipso* presupposes it, and thereby attests its reality. The self can not differ from Brahman, because there is nothing really existent except Brahman. All that can be predicated of Brahman—purely spiritual nature, omnipresence, eternity—holds good of the soul. In this manner the ancient doctrine of the Upanishads is accepted and proved by Çaṁkara. The solution of the problem of existence, the recognition of the only true entity, is to be reached by man, according to this system, only in the depths of his own being.

Into the reason and origin of this "ignorance," which, working as a veil of illusion, conceals the real nature of the world, the Vedānta does not inquire. It simply teaches the fact of ignorance and that ignorance (*a-vidyā*) is destroyed by "knowledge" (*vidyā*) or the "universal understanding" (*samyag-darçana*), which comprehends the illusory nature of all that is not soul and the absolute identity of the soul with Brahman. By this "understanding" the conditions for the continued mundane existence of the soul are annulled. This existence is indeed naught but a false semblance—an illusion; and by the full realization of this truth release or final deliverance (*moksha*) is attained.

To the authority of the Upanishads Çaṁkara yields unqualified acceptance. But their teachings contradict bluntly some of the doctrines above propounded. Çaṁkara therefore has to settle his score with them as best he may. This he does by the establishment or allowance of two systems side by side. The essence of the one is the "higher" or esoteric "knowledge" (*parā vidyā*), which knowledge corresponds to the metaphysical point of view (*pāramārthikā 'vasthā*), and recognizes the doctrine of "Brahman without a second" as the absolute truth. The other system is that of the "lower" or exoteric "knowledge" (*aparā vidyā*), which corresponds to the empirical point of view (*vyāvahāriky avasthā*) of the masses, and offers a popular religious explanation of the world. To the higher knowledge, Brahman is divested of all attributes and qualities (*nirguṇa*); but by the lower knowledge he is invested with the attributes of personality (*saguṇa*). These are ascribed by ignorance to Brahman, because those men who can not rise to the height of the metaphysical point of view feel themselves to be in need of some object of worship. In the system of the lower knowledge, accordingly, Brahman appears as a personal God (*īçvara*), who creates and rules the world and rewards and punishes men according to their deeds. In the lower system the multiform world passes for real; and for the statements of the Upanishads concerning the wandering of the soul through countless bodies, there is in the lower system no especial need of proof. The lower system teaches that the soul is restricted by the psychical apparatus, by the senses, by the life principle, and by its status as determined by karma; that it goes through the round of transmigration under these restrictions; and that by faithful worship of the personal lower Brahman the soul, at the end of any particular corporeal existence, may attain unto the lower Brahman. Such union with the lower Brahman, however, is only a transitory happiness; complete release or salvation—that is, the surcease of the metempsychosis—is attainable only by the "universal understanding" of the higher, attributeless Brahman, and from the metaphysical point of view. All that is taught by the lower system is utterly nugatory for him who has recognized his own self as the eternal and indivisible or impartible Brahman. He who has attained to this supreme recognition is no longer befooled by the deceitful and illusory semblances that surround him. Completely indifferent to the doings of the world about him, he calmly awaits his end. Life does not close immediately upon the attainment of the redeeming knowledge, but keeps on for a while, just as the potter's wheel keeps on turning for a little after he has finished the pot. But with death, the truly wise man loses himself in the supreme Brahman.

Of the interpreters of the Vedānta who differ from the great Çaṁkara and who give authoritative expression to the religio-philosophical views of certain sects, the most important is Rāmānuja, who lived in the first half of the twelfth century. His conception of the Vedānta approaches more nearly Çaṁkara's "lower system"; and he teaches that the individual souls are not identical with the supreme soul or God, and that salvation (which he regards as union with the Supreme) is to be attained only by faith in God and love to God. These views, which have some likeness to Christian views, were interpreted into Bādarāyaṇa's compendium by Rāmānuja because he belonged to the ancient Indic sect of Bhāgavatas or Pāncharātras, who professed an originally non-Brahmanical popular monotheism and looked for salvation solely in love to God or *bhakti*, properly love resting on faith. Rāmānuja's system is best set forth by R. G. Bhandarkar in his *Report on the Search for Sanskrit Manuscripts during the Year 1883–84* (Bombay, 1887).

For an admirable account of the system, see Deussen's *Kurze Uebersicht der Vedantalehre*, which forms an appendix to his *System des Vedanta*. The Vedānta philosophy has called forth a very extensive literature in India. Dr. Fitzedward Hall, in his *Bibliography of the Indian Philosophical Systems* (Allahabad, 1859), enumerates 310 Sanskrit works upon the Vedānta, and works upon this system appear every year in all parts of India, partly in Sanskrit and partly in the various vernaculars. The great majority of these modern publications are written from Çaṁkara's point of view; and they bear witness to the powerful influence which the spiritual pantheism of the Vedānta still exercises, as it did ages ago, upon the heart and mind of the thinking Hindu. RICHARD GARBE.

Translated by C. R. LANMAN.

Veddahs: a primitive hill tribe of Ceylon, found only in the eastern part of the island, S. of Trincomali Bay, especially at the eastern foot of the central cluster of mountains. They numbered in 1881 2,228 individuals, of whom about 200 were wild, the remainder being in various stages of advance toward the Singhalese civilization. The interest in them lies in the fact that they are one of the rare remnants of the primitive types of mankind. They are small (men 5 ft. 2 in., women 4 ft. 10 in.), brown, with undulating hair; the capacity of the cranium is remarkably small, but the profile is straight and fine. The wild Veddahs are consummate archers, live by hunting, have the simplest possible dwellings, and wear little or no clothing. The internal government is patriarchal. The Veddahs make good husbands and fathers, and are very docile, somber, hospitable, courageous, honest, contented, very truthful, jealous, and vindictive—on the whole, much more like Rousseau's idealized primitive man than like the conventional savage. They form the subject of a considerable literature, some of it fanciful and apocryphal. The authoritative work on them is by the brothers Sarasin, entitled *Die Weddas von Ceylon und die sie umgebenden Völkerschaften*, making vol. iii. of their *Ergebnisse naturwis. Forschungen auf Ceylon* (1892–93). M. W. HARRINGTON.

Vedder, ELIHU: painter; b. in New York, Feb. 26, 1836; pupil of Picot, Paris; member of the Society of American Artists 1880; National Academician 1865; honorable mention, Paris Exposition, 1889. He went to Italy in 1856, and has resided almost continuously in Rome since then. He

illustrated *The Rubáiyát of Omar Kháyyám* (1883–84), and his designs for decorative work show fertility of invention and are excellent in composition. His pictures are remarkable for originality of conception. Among his best-known works are *Lair of the Sea Serpent*, in the Museum of Fine Arts, Boston; *Young Marsyas*, and *Cumæan Sibyl*.
W. A. C.

Ved'el, Anders Sörensen: historian; b. at Veile, Denmark, Nov. 3 or 9, 1542. In 1561 he entered the university, and in 1562 accompanied Tycho Brahe to Germany, where, with the exception of a short visit home, he remained until 1567. In 1568 he was appointed court preacher to Frederick II., but on the death of his patron he fell into disfavor. His translation of *Saxo* is the most important work of the century, from both an historical and a linguistic standpoint, marking the real beginning of modern Danish prose. At the suggestion of friends he began to collect material for an original history of Denmark, in Danish, from Saxo's time, but in 1595 he was compelled to deliver all his books and MSS. to one Niels Krag, who had been commissioned to prepare a similar work in Latin. This latter attempt proved unsuccessful, and after Krag's death Vedel's material was dispersed. Of hardly less interest than the *Saxo* is *Et Hundrede udvalgte Viser* (1591), the first printed collection of Danish ballads. In accordance with the practice of his contemporaries, Vedel wrote a number of funeral discourses, epitaphs, etc., and translated Latin poems. D. at Ribe, Feb. 13, 1616. D. K. Dodge.

Veer: See Campveer.

Vega, Garcilaso, de la: Spanish poet. See Garcilaso de la Vega.

Vega, vā'găă, Garcilaso, de la: historian; b. at Cuzco, Peru, Apr. 12, 1539. His father, of the same name, was a distinguished Spanish officer, who served under Alvarado and Pizarro, and subsequently married a niece of the Inca Huaina Capac, whence the son commonly added Inca, or Ynca, to his name. As a boy he witnessed many events of the civil wars. His mother taught him the Indian language, and he frequently mentions an old uncle who related to him many customs and traditions of the race. Attaining manhood, he traveled over the old Inca realm, and became familiar with its people and monuments. His father died in 1559, and he himself, becoming an object of suspicion, went to Spain in 1560. There he served in the army as a captain, but after 1584 he devoted himself to literature. His *La Florida del Inca* (1605 and subsequent editions) is a narrative of Soto's expedition to Florida, and has considerable historical value. Much more important are his *Comentarios reales de los Incas* (1609) and *Historia general del Perú* (1617), both of which are well known from various later editions and translations. They are prime authorities on the early history of Peru, and generally painstaking and accurate, though naturally colored by the author's prejudices in favor of his race. Garcilaso resided for some years at Lisbon, in comparative poverty. He subsequently returned to Spain, and died in Cordova, or perhaps in Valladolid, after 1617. Herbert H. Smith.

Vega, Georg, von, Baron: mathematician; b. at Sagoritza, Carniola, Austria, in 1756; studied at the lyceum of Laibach; became Professor of Mathematics at the military academy; was made commander of a regiment of artillery, and fought with distinction in the wars against the Turks and the French; was ennobled in 1800. He was murdered Sept. 26, 1802. His *Vorlesungen über die Mathematik* (4 vols.) has often been reprinted, and is still used as a textbook in mathematical instruction in many Austrian institutions. His *Logarithmentafeln* (2 vols., 1783) reached its 57th edition in 1876.

Vega Carpio, -kăăr'pĕe-ō, Félix Lope, de: dramatist and poet; b. in Madrid, Spain, Nov. 25, 1562. He was very precocious, writing his first play at the age of eleven; studied at the University of Alcalá, where he took his bachelor's degree at sixteen; took part in the Spanish Armada in 1588; was secretary to several noblemen; married twice, becoming a priest and an inquisitor after the death of his second wife, before 1614; was made doctor of theology and a Knight of Malta by Pope Urban VIII. (whence his title of *Frey*), and for years before his death was the idol of the court and of the people of Madrid. D. in Madrid, Aug. 26, 1635. He is the most prolific writer known. He wrote, according to his own computation, 1,800 three-act plays, besides 400 *autos*, several long epic poems and prose romances, and short dramatic interludes and lyric poems of all kinds beyond count. About 450 of his plays have been printed, 150 more are known to exist, but probably the greater part of his work is lost, even the titles of the plays being unknown. This is in part due to the little regard he had for his own dramatic work. In his own eyes and those of his contemporaries he was a great poet, "the phœnix of intellects," "the prodigy of nature," whose fame was assured by his great epic poems. He was a born improviser to whom every form of verse was equally easy, the native Spanish measures no less than the difficult Italian forms, drawing inspiration from all sources, from the Italian *novellieri*, from classical antiquity, from the Bible, and especially from Spanish life and history and popular poetry.

It is on his plays, however, that Lope's fame rests. He is the founder of the Spanish national drama. The forms and proportions he gave to it, the models set by him for development of plot and treatment of subjects, followed by his contemporaries and immediate successors, have remained substantially unaltered. Like the pastoral romance, the national drama of Spain had an important influence on the literature of France and of Italy. In depth of thought and in dramatic power Lope is surpassed by Calderon, in careful finish single plays of other authors are superior to his, but in originality, in fertility of invention, in the dash, constant action, and skillful management of plot essential to the drama of intrigue, he is unexcelled. One stage type, the *gracioso*, a parody on the heroic characters, he created. His *comedias* are almost all divided into three *jornadas* or acts, written usually in the four-foot verse of the ballads, which he breaks and varies as he pleases with every conceivable form of verse. The plot may be tragic. Ticknor divides the plays into *comedias de capa y de espada*, involved intrigues of love with a comic underplot, such as *The Slave of her Lover*, *The Whims of Belisa*, *The Gardener's Dog*, and *A Fool to others and Wise to herself*; *comedias heróicas*, in which the facts or at least the names are historical, such as *The Perfect Prince*, *Punishment without Vengeance*, and his masterpiece, *The Star of Seville*; *comedies of common life*, such as *The Captives of Algiers* and *The Water-girl*, in which Lope shows that he can draw real characters; and finally the *comedias de santos* and other religious plays, written when, after the prohibition of secular plays in 1598, Lope turned to the Bible and to the lives of the saints for his plots. Examples are *The Fair Esther*, *The Cardinal of Bethlehem*, and *San Isidro of Madrid*.

Pérez de Montalván's *Life* of Lope, written in 1636, is the foundation for all other biographies. That by C. A. de la Barrera (1893) is in vol. i. of the edition of Lope's works published by the Spanish Academy. *Lives* in English are by Lord Holland (1806), and by G. Ticknor, in vol. ii. of the *History of Spanish Literature* (6th Am. ed., 1888), the best of all accounts of Lope. Sancha published in 1776–79 the non-dramatic works in twenty-one volumes. Of the plays twenty-five (28) volumes were printed in Lope's lifetime. No other attempt at a collected edition was made before the new edition of the Academy, of which three volumes have appeared (1895). The only large available selection is by J. E. Hartzenbusch, forming four volumes of Rivadeneyra's *Biblioteca de Autores Españoles*. G. Bendelari.

Vegetable Alkali: another name for potash. See Potassium.

Vegetable Butter: See Butter.

Vegetable Flannel: a material woven in Germany, Norway, and the U. S. from leaves of the pine (*Pinus sylvestris*) after the turpentine has been distilled off. The fabric is reputed to have useful medicinal properties, and is especially worn by persons suffering from rheumatic or pulmonary complaints.

Vegetable Gardening: See Olericulture.

Vegetable Histology: See Histology, Vegetable.

Vegetable Ivory: the hardened kernel of the corozo-nut, the fruit of *Phytelephas macrocarpa*, a South American tree; so called from its resemblance to ivory, for which it is extensively used as a substitute. Some specimens have a translucency entirely wanting in ivory.

Vegetable Kingdom: the plant world; the aggregate of organisms called plants. It is co-ordinate with the animal kingdom, and these two include all the forms of organic life on the earth. It is not possible to define precisely the line that separates the lower portions of these two king-

doms, and perhaps we may best regard them simply as branches of one great group, inseparable below, but widely divergent above. (See Fig. 1.) For a discussion of the differences between plants and animals, see the articles BOTANY and ANIMAL.*

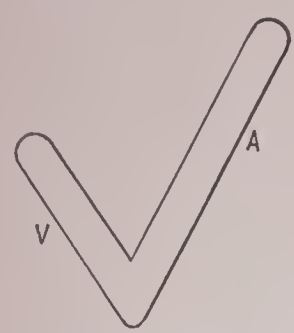

FIG. 1.—Diagram to show the relation of the vegetable kingdom, V, to the animal kingdom, A.

The vast assemblage of plants constituting the vegetable kingdom includes, according to estimates made by Saccardo, about 400,000 species, less than half of which have been described. The principles of classification necessarily used in their consideration are set forth in the article BOTANY (*q. v.*). For a brief discussion of the genetic relationship of plants, see ANCESTRY OF PLANTS. The relationship of the larger groups may be graphically represented by the accompanying diagram, but a plane figure can not properly represent the mutual relations of the diverging genetic lines. Moreover, no attempt has been made to represent the myriads of smaller branches and branchlets in this genealogical tree of plants.

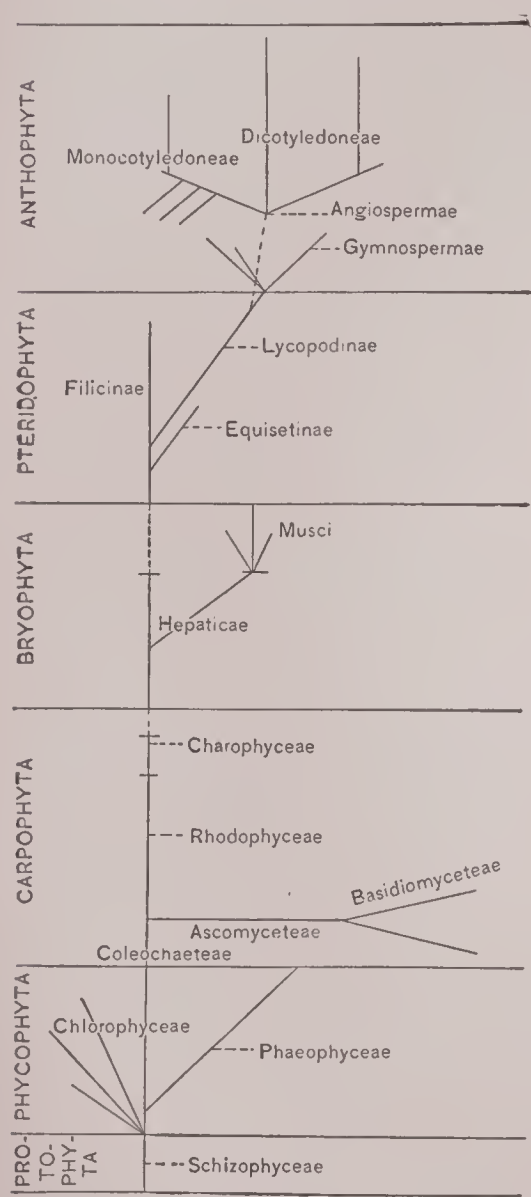

FIG. 2.—Genealogical tree of the branches and classes.

It now remains to present, in summary form, brief descriptions of the branches, classes, orders, and families of the vegetable kingdom. In doing so the sequence is from the primitive or simpler forms to those which are derived or more complex, and since it has frequently happened that two or more groups had a common origin, we are compelled again and again to return to the same point, in order to follow out successively the diverging genetic lines. Moreover, it must not be forgotten that in many cases the derived forms have suffered great degradation, as in the case of the hysterophytes, where we must pass from the structurally more complex plants to the simpler ones. In the fungi, for example, the RUSTS (*q. v.*) are structurally simpler than the Cup Fungi; but the latter are much nearer to the primitive type from which both they and the Rusts were derived, and hence must be described first in a natural system of classification. So, too, in the flowering plants, we find many cases of a progressive simplification as we follow genetic lines; thus the grasses and sedges, although bearing much simpler flowers than the lilies, are to be regarded as modified from the lily type. The grasses are thus further removed from the primitive monocotyledons, and are therefore *in this sense* higher than the lilies. Among the dicotyledons there are numerous cases of simplification, many of which have been quite puzzling to systematists. The Apetalæ of the older botanists are very largely, if not entirely, modified from choripetalous and gamopetalous types. They constitute, in fact, many smaller divergent genetic lines, which pass out from points upon the larger stems of the *Choripetalæ* and *Gamopetalæ*.

* The reader is reminded that in this article, as elsewhere in this cyclopædia, the SLIME MOULDS (*q. v.*) are regarded as falling outside of the limits of the vegetable kingdom.

Branch I. **PROTOPHYTA.** Protophytes; Water-slimes.

Single cells, or chains of cells, reproducing by fission and endospores. Plants minute, aquatic, and normally blue-green, brownish-green, or fuliginous. See PROTOPHYTES.

Class 1. SCHIZOPHYCEÆ (Cyanophyceæ). Fission Algæ. Characters those of the branch. About 1,000 species are known.

Order CYSTIPHORÆ (Chroococcaceæ). Plants unicellular, single or associated in families.

Family *Chroococcaceæ*. Species of *Chroococcus*, *Glœocapsa*, and *Merismopedia* are common in ponds and pools.

Order NEMATOGENEÆ (Nostochineæ). Plants multicellular, forming simple threads, which float on or in water, often forming large greenish or blackish masses.

Family *Nostocaceæ*. Threads mostly moniliform, with intercalated or terminal heterocysts. *Nostoc* is the principal genus.

Family *Oscillariaceæ*. Threads cylindrical, cells uniform (no heterocysts); often motile. *Oscillaria* and *Lyngbya* are common genera.

Family *Rivulariaceæ*. Threads mostly attenuated from a large basal heterocyst. *Rivularia* is the typical genus.

Family *Scytonemaceæ*. Threads cylindrical, with intercalated heterocysts, pseudo-ramose.

Family *Bacteriaceæ*. The bacteria are probably degenerated *Nostocaceæ* and *Oscillariaceæ*. See BACTERIA.

Branch II. **PHYCOPHYTA.** Phycophytes; Spore-tangles.

Single cells, chains, or masses, the latter sometimes forming a branching plant with rhizoids. Sexual reproduction by the union of two protoplasts to form a single resting-spore. See PHYCOPHYTES.

Class 2. CHLOROPHYCEÆ. Green Algæ. Chlorophyll-green, one-celled or filamentous plants, rarely composed of a plate of cells. (A few hysterophytes are chlorophyll-less). Nearly 7,000 species are known.

Order PROTOCOCCOIDEÆ. Plants unicellular, single or associated in families; sexual reproduction mostly by the union of zoöspores. Species from 550 to 600.

Family *Palmellaceæ*. The Green Slimes. Vegetative cells without cilia, not motile, mostly solitary or in loose families. *Protococcus*, *Palmella*, and *Tetraspora* are examples of the single-celled forms, while *Pediastrum*, *Scenedesmus*, and *Hydrodictyon* are in families. See PROTOCOCCUS.

Family *Volvocaceæ*. Vegetative cells with cilia, motile, solitary or united into motile families. *Chlamydomonas* and *Hæmatococcus* (*H. lacustris*, the red snow-plant of the Arctic regions) are unicellular; *Pandorina* forms isogamic colonies, while *Eudorina* and *Volvox* form oögamic colonies. The last three are doubtfully vegetable in nature.

Family *Synchytriaceæ*. Vegetative cells, at first naked, spherical or ellipsoidal, parasitic in the cells of (mostly lower) plants and animals, without chlorophyll, at length forming a wall and becoming a zoösporangium, or forming a single thick-walled resting-spore. Nearly 100 species are known, inhabiting Diatoms, Pond Scums, etc. Species of *Synchytrium* are parasitic in the epidermal cells of flowering plants.

Family *Chytridiaceæ*. Vegetative cells with a wall, usually elongated or filiform, parasitic in the cells of (mostly lower) plants and animals, without chlorophyll, forming zoösporangia or one or more thick-walled resting spores. About 100 species (of *Lagenidium*, *Ancylistes*, *Rhizophidium*, *Chytridium*, etc.) are known, inhabiting diatoms, desmids, and other aquatic plants. It is quite probable that some of the forms here brought together are degraded *Siphoneæ* and *Confervoideæ*.

Order CONJUGATÆ. Plants unicellular, or cylindrical unbranched chains of cells (rarely branching tubes), reproducing sexually by the direct union of the contents of two cells. Species about 5,250.

Family *Desmidiaceæ*. The Desmids. Plants unicellular, bilobed, or fusiform, free, rarely united in chains, walls of cellulose only. See DESMIDS.

Family *Diatomaceæ*. The Diatoms. Plants unicellular, free or less commonly united in chains; walls siliceous. See DIATOMS.

Family *Zygnemaceæ*. The Pond-scums. Plants consisting of chains of cylindrical cells. *Spirogyra*, *Zygnema*, and *Mougeotia* are typical genera.

Family *Mucoraceæ*. The Black Moulds. Mostly saprophytic plants (rarely parasitic upon one another), filiform, branching, sparsely septated, without chlorophyll; conidia formed internally (in a "sporangium") or by abstriction. See MUCORACEÆ.

Family *Entomophthoraceæ*. The Insect Fungi. Parasites inhabiting the bodies of insects; filaments very short, branching, septated (or the cells separate), without chlorophyll; conidia formed singly by abstriction. See FLY FUNGUS.

Order SIPHONEÆ. Plants tubular (or lobed), branching, partitions rarely formed; sexual reproduction by the union of zoöspores, or the fertilization of oöspheres by antherozoids. About 250 species are known.

Family *Hydrogastraceæ*. Plants terrestrial, minute, globose, with branching rhizoids; sexual reproduction isogamic. But one genus, *Botrydium*, is known.

Family *Phyllosiphonaceæ*. Minute, green, branching plants, parasitic in the tissues of aquatic plants, evidently related to the preceding family.

Family *Udoteaceæ*. Plant compound, consisting of di- or trichotomous tubes, always incrusted with lime; sexual reproduction isogamic. Marine.

Family *Spongodiaceæ*. Plant compound, spongy, spherical or cylindrical, simple or dichotomously branched, consisting of many branching intertwined tubes; sexual reproduction isogamic. Marine.

Family *Caulerpaceæ*. Plant a horizontal tube with rhizoids, and bearing erect lobulated or pinnatifid branches; sexual reproduction isogamic. Marine.

Family *Bryopsidaceæ*. Plant pinnately branched; sexual reproduction isogamic. Marine.

Family *Derbesiaceæ*. Plant filiform, simple, or irregularly branched; sexual reproduction isogamic. Marine.

Family *Dasycladiaceæ*. Plant filiform, with short verticillate branches; sexual reproduction isogamic. Marine.

Family *Vaucheriaceæ*. The Green Felts. Plant filiform, irregularly branched; sexual reproduction oögamic. The thirty to forty species belong to the genus *Vaucheria*; they occur in fresh or marine waters, and even on moist soil.

Family *Saprolegniaceæ*. The Water-moulds. Aquatic plants parasitic or saprophytic in the tissues of animals, filiform, irregularly branched, and without chlorophyll; sexual reproduction oögamic. See WATER-MOULDS.

Family *Peronosporaceæ*. The Downy Mildews. Plants parasitic in the tissues of higher plants, filiform, irregularly branched, and without chlorophyll; sexual reproduction oögamic. See MILDEWS.

Order CONFERVOIDEÆ. Plant a cylindrical chain or a plate of cells; sexual reproduction by the union of zoöspores or the fertilization of oöspheres by antherozoids. Species from 850 to 1,000.

Family *Ulvaceæ*. Sea-lettuces. Plant a plate of a single layer of cells, or a tube of cells, or by collapsing a plate of two layers; sexual reproduction isogamic. Mostly marine.

Family *Ulotrichiaceæ*. The Confervas. Plant filiform, mostly simple, with lateral rhizoids; cell-walls thin; sexual reproduction isogamic. Mostly in fresh water. See CONFERVA.

Family *Chroolepidiaceæ*. Plant minute, epiphytic or aërial, filiform, branching; from yellow to red in color; sexual reproduction isogamic.

Family *Cladophoraceæ*. The Water-flannels. Plant filiform, mostly branching, with lateral rhizoids, cell-walls thickened and lamellated; sexual reproduction isogamic. Mostly in fresh water.

Family *Pithophoraceæ*. Plant filiform, branching, ending below in simple or branching colorless rhizoids; sexual reproduction isogamic. In fresh water.

Family *Sphæropleaceæ*. Plant filiform, simple, free-swimming; sexual reproduction oögamic, gametes biciliated, oöspheres several in each oögone. In fresh waters.

Family *Cylindrocapsaceæ*. Plant filiform, simple, at first attached, then free-swimming; sexual reproduction oögamic, gametes biciliated, oöspheres one in each oögone. In fresh waters.

Family *Œdogoniaceæ*. Plant filiform, simple or branched, attached below by rhizoids; oöspheres large, not ciliated, one in each oögone; antherozoids with a crown of cilia. In fresh waters. The principal genus is *Œdogonium*.

Class 3. PHÆOPHYCEÆ. Brown Algæ. Olive-green filamentous or more commonly massive plants with rhizoids, having in their cells, in addition to chlorophyll, a brown coloring-matter (phycophæin). About 1,100 species are known, marine (with a very few exceptions).

Order PHÆOSPOREÆ. Plant from a minute filament to a large flat or much-branched thallus, producing zoöspores in two kinds of zoösporangia: (1) simple, containing one zoöspore; (2) compound, containing many zoöspores; sexual reproduction by the union of zoöspores; asexual reproduction by the direct growth of zoöspores.

Family *Ectocarpaceæ*. Plant filamentous, monosiphonous or polysiphonous; zoösporangia in or on the filaments, the simple globose or cuboidal, the compound muriform. Mostly small or even microscopic plants, resembling the *Confervoideæ*. In at least one genus there are fresh-water species.

Family *Mesoglœaceæ*. Plant mostly gelatinous, globose, irregular or cylindrical, composed of a basal or axial mass of cylindrical cells, covered by a cortex of closely packed vertical rows of cells; both kinds of zoösporangia produced among the cortical cells. Mostly small plants, forming gelatinous masses on larger seaweeds.

Family *Punctariaceæ*. Plant simple or branched, membranaceous, cylindrical or filamentous; zoösporangia in superficial sori, the simple spherical, the compound (where known) ellipsoidal and few-celled. Plants often of considerable size, 10 to 20 cm. or more.

Family *Arthrocladiaceæ*. Plant filiform, branching, composed of an axial row of large cells covered with several layers of polygonal cortical cells; compound zoösporangia moniliform, on slender branches, the simple unknown. Plants often of considerable size, 20 to 30 cm. or more.

Family *Sporochnaceæ*. Plant upright, cylindrical or compressed, solid or hollow, consisting of several layers of polygonal cells; both kinds of zoösporangia in external, scattered sori, intermixed with jointed paraphyses. Plants often of considerable size, 10 to 100 cm. or more.

Family *Scytosiphonaceæ*. Plant unbranched, membranaceous or tubular; compound zoösporangia densely covering the whole surface, intermixed with club-shaped paraphyses, the simple unknown. Plants 10 to 30 cm. or more in length.

Family *Laminariaceæ*. Plant large, flat or cylindrical, composed of many layers of cells; simple zoösporangia in large sori, bands, or over the whole surface, intermixed with club-shaped paraphyses, the compound unknown. These are the KELPS (*q. v.*), which include common species several meters in length, and a Pacific Ocean species 100 or more meters long.

Family *Ralfsiaceæ*. Plant parenchymatous, horizontally expanded, sometimes crustaceous; both kinds of zoösporangia spheroidal, in wart-like sori, the simple intermixed with jointed paraphyses, the compound without paraphyses. Small plants attached to stones and shells.

Family *Lithodermaceæ*. Plant parenchymatous, horizontally expanded, crustaceous; both kinds of zoösporangia in superficial sori, the compound with intermixed, jointed paraphyses. Small plants attached to stones and shells, all marine, with the exception of two species.

Family *Cutleriaceæ*. Plant parenchymatous (not crustaceous), flat, erect or prostrate; zoösporangia in superficial sori, the simple without and the compound with jointed paraphyses. In this family a differentiation into oöspheres and antherozoids is attained, the simple zoösporangia producing the former and the compound the latter. The plants are from 1 cm. or so to 30 or 40 in height, and are mostly natives of the warmer seas.

Order DICTYOTEÆ. Plant flat, parenchymatous; sexual (?) reproduction by the fertilization of motionless oöspheres by motionless antherozoids; asexual reproduction by means of motionless tetraspores.

Family *Dictyotaceæ*. Plants of considerable size, from a few centimeters to a meter or more in length, often beautifully marked with colored zones, and remarkable in showing affinities to the *Phæophyceæ* and *Rhodophyceæ*.

Order FUCOIDEÆ. The Fucoids. Plant a more or less branching massive thallus; sexual reproduction by the fertilization of a motionless oösphere by motile antherozoids; asexual reproduction wanting.

Family *Fucaceæ*. Plant of considerable size, from a few centimeters to a meter in length, common on rocks between tide-marks, hence called Rockweeds. See FUCOIDS.

Branch III. **CARPOPHYTA**. Carpophytes; Fruit-tangles.

Chains, plates, or masses of cells, the latter often forming a branching plant with rhizoids. Sexual reproduction

(where known) by the union of two dissimilar protoplasts to form a spore-fruit. See CARPOPHYTES.

Class 4. COLEOCHÆTEÆ. Simple Fruit-tangles. Chlorophyll-green plants, consisting of jointed, irregularly branched, radiating filaments, sometimes compacted into a flat plate; spore-fruit simple, consisting of a large spore (carpospore) inclosed in a subsequently formed layer of cells. About a dozen species are known.

Order COLEOCHÆTACEÆ. Minute plants, 6 mm. or less, with the characters of the class.

Family *Coleochætaceæ*. Aquatic, attached to the surfaces of water-plants, some of the cells with colorless, bristle-like protuberances growing from narrow sheaths.

Family *Mycoideaceæ*. Parasitic in the leaf tissues of higher plants; bristle-like protuberances wanting. Doubtfully referred to this class.

Class 5. ASCOMYCETEÆ. Sac Fungi. Chlorophyll-less plants (hysterophytes) consisting of jointed, branching filaments, sometimes compacted into parenchymatous masses; spore-fruit spherical, cup-shaped, or irregular, simple or compound, always including one or more spore-sacs (asci) containing spores (ascospores). Nearly 20,000 species are now known, to which may be added about 12,000 more of the "imperfect fungi," here included in this class. See FUNGI.

Order PERISPORIACEÆ. Simple Sac Fungi. Plant filamentous (the mycelium), producing minute, simple, mostly spherical closed spore-fruits, consisting of one to many asci inclosed in a hard cellular shell (perithecium). Species about 500.

Family *Erysipheæ*. Superficial parasites upon higher plants, with abundant simple vertical conidiophores, the blackish fruits with radiating, usually forked appendages. These are the Powdery Mildews. See MILDEWS.

Family *Perisporieæ*. Mostly saprophytes, with the yellow or black fruits, usually without appendages. Not well defined from the *Erysipheæ* by structural characters.

Order TUBEROIDEÆ. Subterranean Sac Fungi. Plant filamentous (mostly subterranean), producing spheroidal, compound (usually large) spore-fruits, containing internally many spherical cavities in which are the asci; species about 130.

Family *Onygenaceæ*. Parasitic or saprophytic on horns, bones, etc.; fruit waxy, at length pulverulent.

Family *Elaphomycetaceæ*. Fruit subterranean, woody or crustaceous.

Family *Tuberaceæ*. Fruit subterranean, fleshy. The most important genus is Tuber with about fifty species, including the truffles (*T. æstivum*). See FUNGI and TRUFFLE.

Order PYRENOMYCETEÆ. Black Fungi. Plant filamentous (in many "lichens" compacted into a thallus), producing spheroidal simple or mostly compound spore-fruits, consisting of a hard cellular mass (stroma) in whose surface the perithecia are partially imbedded. Species about 9,000.

Family *Sphæriaceæ*. Simple or compound; perithecia black, membranaceous, coriaceous or carbonaceous, differing in substance from the stroma; ostiole round.

Family *Hypocreaceæ*. Simple or compound; perithecia mostly reddish, sub-carnose or waxy membranaceous, differing in substance from the stroma; ostiole round.

Family *Verrucariaceæ*. Lichen-forming fungi, with globular fruits; ostiole round. See LICHENS.

Family *Dothidiaceæ*. Compound; perithecia black, coriaceous or carbonaceous, confluent with the stroma; ostiole round. See PLUM KNOT.

Family *Microthyriaceæ*. Simple; perithecia black, sub-superficial, membranaceous or carbonaceous; no ostiole.

Family *Lophiostomaceæ*. Simple; perithecia black, adnate at base or sub-superficial, mostly carbonaceous; ostiole elongated.

Family *Hysteriaceæ*. Simple; perithecia mostly blackish, erumpent superficial, horizontally oblong or linear; ostiole a long fissure.

Family *Laboulbeniaceæ*. Minute and greatly reduced sac fungi, with simple fruits, parasitic externally upon the bodies of insects.

Order DISCOMYCETEÆ. Cup Fungi. Plant filamentous (in many "lichens" compacted into a thallus), producing mostly cup-shaped or disk-shaped fruits, the asci and intermixed paraphyses closely pressed together, and constituting the hymenium. Species about 7,000.

Family *Cyttariaceæ*. Fruit globose or ovoid, hollow or solid, sub-sessile, fleshy, plurilocular externally.

Family *Helvellaceæ*. Fruit vertical, stipitate; mitrate, clavate, capitate or lacunose-gyrose; fleshy or waxy.

Family *Pezizaceæ*. Fruit cup or disk shaped, fleshy or waxy, stipitate or sessile; asci not readily escaping; growing on decaying vegetable matter.

Family *Ascobolaceæ*. Fruit cup or disk shaped, fleshy or waxy, sessile: asci readily escaping; growing on dung.

Family *Dermateaceæ*. Fruit cup or urn shaped, sub-sessile or stipitate, cæspitose, corky, coriaceous or horny, usually scurfy externally.

Family *Bulgariaceæ*. Fruit top, cup, or disk shaped, sessile or sub-stipitate, gelatinous, at length horny or cartilaginous.

Family *Stictidaceæ*. Fruit minute, immersed; peridium reduced or evanescent; mostly saprophytic.

Family *Graphidaceæ*. Lichen-forming fungi with immersed, rounded or mostly elongated blackish fruits; peridium (exciple) often evanescent. See LICHENS.

Family *Phacidiaceæ*. Fruit minute, immersed, black, more or less coriaceous; mostly parasitic.

Family *Parmeliaceæ*. Lichen-forming fungi with shield-shaped fruits, bordered by a thalline exciple. See LICHENS.

Family *Lecidiaceæ*. Lichen-forming fungi with disk-shaped fruits, bordered with a proper exciple. See LICHENS.

Family *Patellariaceæ*. Fruit minute, superficial, shield or cup shaped, mostly sessile, generally black, coriaceous or horny, glabrous.

Family *Caliciaceæ*. Lichen-forming fungi with top or pear shaped mostly stipitate fruits, the spores free by the breaking of the spore-sacs. See LICHENS.

Family *Cordieritaceæ*. Fruit minute, branching-stipitate, corky or horny carbonaceous.

Family *Gymnoascaceæ*. Extremely degraded parasites, producing single asci upon very short filaments. See PLUM POCKETS.

Family *Saccharomycetaceæ*. Yeast-plants. Extremely degraded saprophytes, few-celled or unicellular, eventually producing few-spored asci. See FERMENTATION and FUNGI.

Order UREDINEÆ. Rusts. Plant filamentous, parasitic in the tissues of higher plants, producing reduced, persistent asci ("teleutospores") in poorly defined fruits; conidia (æcidiospores) and stylospores (uredospores) usually present. Species about 1,500.

Family *Uredinaceæ*. With the characters of the order. See RUSTS.

Order USTILAGINEÆ. Smuts. Plant filamentous, parasitic in the tissues of higher plants, producing reduced, deliquescent asci, in vaguely defined fruits; conidia and stylospores mostly wanting. Species about 300. See SMUTS.

Family *Ustilaginaceæ*. Promycelium septate, bearing lateral sporidia.

Family *Tilletiaceæ*. Promycelium non-septate, bearing terminal sporidia.

"Imperfect Fungi," doubtfully referred to this class:

Order SPHÆROPSIDEÆ. Plant filamentous, producing "perithecia" (but no spore-sacs) in which are conidiophores bearing conidia.

Family *Sphærioidaceæ*. Perithecia membranaceous, carbonaceous, or coriaceous, black, globose to disk shaped, immersed or superficial.

Family *Nectrioidaceæ*. Perithecia fleshy or waxy, whitish to yellow, red or orange, globular to horizontally elongated, erumpent or superficial. Probably imperfect forms of *Hypocreaceæ*.

Family *Leptostromaceæ*. Perithecia membranaceous or carbonaceous, black, shield-shaped, erumpent or superficial.

Family *Excipulaceæ*. Perithecia membranaceous or carbonaceous, black, cup or disk shaped, or horizontally elongated, erumpent or superficial.

Order MELANCONIEÆ. Plant filamentous, producing subcutaneous sori (not "perithecia") of conidiophores bearing conidia.

Family *Melanconiaceæ*. With the characters of the order.

Order HYPHOMYCETEÆ. Plant filamentous, producing isolated, sometimes clustered, superficial conidiophores bearing conidia; "perithecia" and sori wanting.

Family *Mucedinaceæ*. Filaments white or slightly colored, weak, separate; conidia of the color of the filaments.

Family *Dematiaceæ*. Filaments blackish or black (rarely subhyaline), separate; conidia blackish.

Family *Stilbaceæ*. Filaments white or blackish, cohering in dense, elongated, stalk-like fascicles.

Family *Tuberculariaceæ*. Filaments white or blackish, cohering in dense, wart-like masses.

Class 6. BASIDIOMYCETEÆ. Higher Fungi. Chlorophyll-less plants (hysterophytes) consisting of jointed, branching filaments, sometimes compacted into parenchymatous masses; spore-fruit spherical, pileate, or irregular, always including enlarged end-cells (basidia) bearing external spores. About 10,000 species are known. See FUNGI.

Order GASTEROMYCETEÆ. Basidia internal, lining the walls of tortuous cavities. See PUFF-BALLS.

Family *Hymenogastraceæ*. Spore-fruit subterranean, spheroidal, fleshy, not becoming pulverulent.

Family *Lycoperdaceæ*. Puff-balls. Spore-fruit above ground, spheroidal, sessile, or stipitate, at first fleshy, later pulverulent.

Family *Nidulariaceæ*. Bird's-nest Fungi. Spore-fruit top-shaped, coriaceous, partially deliquescing to form "sporangioles."

Family *Phallaceæ*. Stink-horns. Spore-fruit at first spheroidal, fleshy, at maturity partly deliquescing, rupturing and elongating. See STINKHORN FUNGI.

Order HYMENOMYCETEÆ. Basidia developed upon surfaces (hymenia) which eventually or from the first are external. See MUSHROOMS.

Family *Agaricaceæ*. Toadstools. Hymenium on radiating lamellæ (gills).

Family *Polyporaceæ*. Pore Fungi. Hymenium lining tubes or pores.

Family *Hydnaceæ*. Prickly Fungi. Hymenium superficial on prickles or protuberances.

Family *Thelephoraceæ*. Hymenium on the smooth expanded surface of the lower side of the spore-fruit.

Family *Clavariaceæ*. Hymenium on all sides of the fleshy, usually erect, branching spore-fruit.

Family *Tremellaceæ*. Hymenium on all sides of the gelatinous, irregular-shaped spore-fruit.

Class 7. RHODOPHYCEÆ. Red Seaweeds. Red or purple plants, whose cells contain, besides chlorophyll, a red or purple coloring-matter (phycoerythrin), filamentous, cylindrical or membranaceous, simple or branched; spore-fruit spherical or flattened, with or without a cellular covering, always including certain end-cells which separate as spores by abstriction. About 2,000 species are known. See RED SEAWEEDS.

Order FLORIDEÆ. But one order is known, having the character of the class. By Agardh it is divided into six series as follows:

Series I. GONGLYOSPERMEÆ. Spore-fruits external or immersed in the substance of the thallus, surrounded by a gelatinous envelope; spores irregularly arranged; plant mostly filamentous, sometimes solid or compressed.

Family *Ceramiaceæ*. Spore-fruits external.

Family *Cryptonemiaceæ*. Spore-fruits immersed in the substance of the thallus.

Series II. COCCIOSPERMEÆ. Spore-fruits immersed in the swollen thallus, forming rounded conceptacles; spores irregularly arranged; plant terete or flattened, fleshy or hardened.

Family *Gigartinaceæ*. Spore-fruits immersed in ordinary branches of the thallus.

Family *Furcellariaceæ*. Spore-fruits immersed in pod-like "receptacles" at the ends of the branches.

Series III. NEMATOSPERMEÆ. Spore-fruits external, with a cellular pericarp, or sometimes immersed in the thallus; spores in chains radiating from a central cell; plant filamentous, solid, or membranaceous.

Family *Dudresnayaceæ*. Spore-fruit sub-external upon the articulated, branching thallus.

Family *Dumontiaceæ*. Spore-fruit immersed in the tubular or solid, branching thallus.

Family *Spyridiaceæ*. Spore-fruit sub-terminal on the branches of the more or less articulated and always corticated thallus.

Family *Areschougiaceæ*. Spore-fruit sub-external on the tubular or solid thallus.

Family *Champiaceæ*. Spore-fruit external on the tubular-cellular nodulose-diaphragmed thallus.

Family *Rhodymeniaceæ*. Spore-fruit external on the filiform, tubular or solid thallus.

Series IV. HORMOSPERMEÆ. Spore-fruits external or immersed, mostly with a pericarp; spores in short chains or single; plant membranaceous, cylindrical, or flattened.

Family *Squamariaceæ*. Plants forming horizontally expanded crusts, composed of short vertical filaments, sometimes calcareous; spore-fruit containing few spores in short chains.

Family *Corallinaceæ*. Plants encrusted with lime, horizontally expanded or slender branching, sometimes articulated; spore-fruits external or immersed, containing pear-shaped spores on short filaments.

Family *Sphærococcoideæ*. Plants without lime; external cells round; spore-fruits external, hemispherical, or flask-shaped, containing many spores in moniliform filaments.

Family *Delesseriaceæ*. Plants without lime; external cells angled; spore-fruits external, hemispherical, or flask-shaped.

Series V. DESMIOSPERMEÆ. Spore-fruits external or immersed, mostly with a pericarp; spores borne on central or parietal, simple or branching placentæ; plant filamentous, cylindrical or compressed.

Family *Helminthocladiaceæ*. Plant filamentous; spore-fruits immersed; spores in chains radiating from a central cell.

Family *Chætangiaceæ*. Plant tubular, or solid and cylindrical or compressed; spore-fruits external or partly immersed; spores parietal.

Family *Gelidiaceæ*. Plant filiform or compressed, of dense cartilaginous structure; spore-fruits immersed in special branches, spores on axile or parietal placentæ.

Family *Hypneaceæ*. Plant filiform or sub-compressed; spore-fruits external or partly immersed; spores in tufts on branching placentæ.

Family *Solieraceæ*. Plant filiform or compressed; spore-fruits immersed; spores in short filaments on a central cell or placenta.

Series VI. CORYNOSPERMEÆ. Spore-fruits external, with a pericarp; spores borne on a cellular, basal placenta; plant filamentous, or solid and cylindrical.

Family *Wrangeliaceæ*. Plant jointed, naked or corticated; spore-fruit external, consisting of one or more naked spores.

Family *Spongiocarpeæ*. Plant solid, cylindrical, branching; spore-fruit in wart-like protuberances; spores axile.

Family *Lomentariaceæ*. Plant filamentous, tubular-cellular, branching, hollow, with constricted nodes; spore-fruits external; spores axile.

Family *Chondriaceæ*. Plant tubular or solid; spore-fruits external or partly immersed spores from a basal placenta.

Family *Rhodomeliaceæ*. Plant filiform-branching, or membranaceous; spore-fruits external, with a distinct ovate or urn-shaped pericarp; spores pyriform, stalked, upon a basal placenta.

Class 8. CHAROPHYCEÆ. Stoneworts. Chlorophyll-green plants, consisting of single rows of elongated cells (often corticated) bearing whorled branches; spore-fruit ovoid, consisting of a large spore (carpospore) inclosed in a previously formed layer of elongated cells. Species about 150.

Order CHARACEÆ. With the characters of the class. See STONEWORTS.

Family *Nitelleæ*. Plant not corticated; crown of spore-fruit of ten cells.

Family *Chareæ*. Plant often corticated; crown of spore-fruit of five cells.

Branch IV. **BRYOPHYTA**. Bryophytes. Mossworts.

Masses of cells, forming a flat branching plant with rhizoids, or a leafy stem (the oöphore); sexual reproduction by the union of two protoplasts and the formation of a leafless, spore-bearing stem (the sporophore). See MOSSWORTS.

Class 9. HEPATICÆ. Liverworts. Plant body mostly bilateral, a thallus, or leafy axis with mostly two-ranked, veinless leaves; root hairs one-celled; spore-fruit indehiscent or two- to four-valved, mostly containing elaters. Species about 3,500.

Order MARCHANTIACEÆ. Spore-fruits indehiscent, with or without elaters; plant thallose.

Family *Ricciеæ*. Crystalworts. Small, mostly radiate-thallose plants; spore-fruits sessile in the upper surface of the thallus; no elaters.

Family *Targonieæ*. Branching thallose plants; spore-fruits single, short-stalked; elaters present.

Family *Marchantieæ*. Liverworts proper. Branching thallose plants; spore-fruits clustered on the under side of a peduncled "receptacle"; elaters present.

Order ANTHOCERATACEÆ. Horned Liverworts. Spore-fruits with a columella, two-valved, with elaters; plant a thallus.

Family *Anthoceroteæ*. Small thallose plants, with slender club-shaped spore-fruits growing from the upper surface.

Order JUNGERMANNIACEÆ. Scale-mosses. Spore-fruits

stalked, four-valved, containing elaters; plants mostly leafy-stemmed.

A. *Thallose Scale Mosses.—Plant a thallus.*

Family *Metzgerieæ.* Archegonium (and spore-fruits) on the under side of the midrib; involucre single.

Family *Aneurieæ.* Plant without midrib; archegonium marginal; involucre single.

Family *Haplolæneæ.* Archegonium sunken in the upper side of the thallus; involucre single.

Family *Diplomitrieæ.* Archegonium on the upper side of the thallus; involucre double.

Family *Codonieæ.* Pseudo-foliaceous, with leaf-like lobes; archegonium terminal or dorsal.

B. *Foliose Scale Mosses.—Plant usually with two-ranked leaves; archegonium mostly terminal; involucre mostly double.*

Family *Haplomitrieæ.* Plant upright, with three-ranked leaves.

Family *Jubuleæ.* Leaves overlapping upward (incubous); spore-fruit splitting half way down.

Family *Platyphylleæ.* Plant without runners; leaves entire, overlapping upward; spore-fruit splitting to the base.

Family *Ptilidieæ.* Plant without runners; leaves three to four dentate or divided, overlapping upward; spore-fruit splitting to the base.

Family *Lepidozieæ.* Plant with leafless runners; leaves overlapping upward; spore-fruit splitting to the base.

Family *Geocalyceæ.* Leaves overlapping upward or downward; spore-fruit growing from a pendent sac at the side of the stem.

Family *Jungermannieæ.* Leaves overlapping downward (succubous); involucre double.

Family *Gymnomitrieæ.* Leaves overlapping downward; involucre single.

Class 10. MUSCI. Mosses. Plant body a leafy axis, rarely bilateral, with mostly three to many ranked leaves, usually with a midrib; root-hairs a row of cells; spore-fruit mostly opening by a circular lid; no elaters. Species about 4,500.

Order ANDREÆACEÆ. Black Mosses. Small plants with thickish leaves of similar cells; spore-fruit on a pseudopodium, dehiscing by four (or six) longitudinal slits.

Family *Andreææ.* With the characters of the order. A small group of rock-loving mosses, confined to the single genus *Andreæa.*

Order SPHAGNACEÆ. Peat-mosses. Large plants with thick leaves, containing two kinds of cells; spore-fruit on a pseudopodium, dehiscing by a circular lid; no peristome.

Family *Sphagnaceæ.* With the characters of the order. A small group of bog-mosses, confined to the single genus *Sphagnum.*

Order ARCHIDIACEÆ. Small plants with thin leaves of similar cells; spore-fruit sessile, rupturing irregularly.

Family *Archidieæ.* With the characters of the order. A small group of earth-loving mosses, confined to the single genus *Archidium.*

Order BRYACEÆ. True Mosses. Small to large plants, with mostly thin leaves of similar cells; spore-fruit mostly long-stalked, generally opening by a circular lid; peristome usually present.

Series I. CLEISTOCARPÆ. Spore-fruit indehiscent, not opening by a lid.

Family *Phasceæ.* Plants minute; leaves soft, loosely areolate; spore-fruit globular, immersed, sessile to short-stalked.

Series II. STEGOCARPÆ. Spore-fruit opening by a circular lid.

A. *Acrocarpæ.—Spore-fruit terminal.*

Family *Weisiaceæ.* Leaves costate, areolation quadrate above, oblong-hexagonal below; spore-fruit small, ovate to cylindrical pedicellate, erect or pendent; peristome single (of sixteen or thirty-two teeth) or none; calyptra cucullate.

Family *Pottiaceæ.* Leaf areolation quadrate-hexagonal; spore-fruit erect, narrow or cylindrical; peristome single (of sixteen or thirty-two teeth) or none; calyptra mitriform.

Family *Grimmiaceæ.* Leaves opaque, areolation minutely round-quadrate; spore-fruit regular, on a straight or curved pedicel; peristome single (of sixteen teeth); calyptra mitriform.

Family *Orthotrichaceæ.* Leaves costate, areolation minutely round-quadrate; spore-fruit erect, symmetrical; peristome single or double (of eight or sixteen teeth in each row); calyptra mitriform.

Family *Tetraphidaceæ.* Lower leaves small, upper larger, tufted, areolation equal; spore-fruit cylindrical or oval; peristome single (of four teeth); calyptra conical, mitrate.

Family *Disceliaceæ.* Leaves ecostate, areolation loose, of long hexagonal-rhomboidal cells; spore-fruit oval, stalked; peristome single (of sixteen teeth); calyptra split down one side and attached below to the pedicel.

Family *Schistotegaceæ.* Plants annual from a persistent protonema; leaves with loose areolation; spore-fruit subglobose, soft; peristome none; calyptra minute, mitriform.

Family *Splachnaceæ.* Leaves costate, areolation of large cells; spore-fruit with an enlarged base (apophysis); peristome single (of sixteen teeth); calyptra cucullate or mitriform.

Family *Physcomitriaceæ.* Leaves costate, areolation of large hexagonal or rhomboidal cells; spore-fruit oval or spherical, erect; peristome none, or single (of sixteen teeth) or double (of sixteen outer teeth and an inner divided membrane); calyptra cucullate or mitriform.

Family *Bartramiaceæ.* Leaves costate, areolation minute and quadrate above, loose hexagonal-rectangular below; spore-fruit spheroidal, nodding or erect; peristome single (of sixteen teeth) or double (of sixteen outer and sixteen or thirty-two inner teeth); calyptra small, cucullate, fugacious.

Family *Meesiaceæ.* Leaves lanceolate or linear-oblong; spore-fruit long-stalked and long-necked, nodding; peristome double (of sixteen outer and sixteen inner teeth); calyptra fugacious.

Family *Bryaceæ.* Leaves costate, areolation uniform, parenchymatose; spore-fruit globose to pear-shaped, mostly nodding; peristome usually double (of sixteen outer, and sixteen or thirty-two inner teeth); calyptra cucullate.

Family *Polytrichaceæ.* Leaves thick, costate; spore-fruit long-stalked, erect or nodding, cylindrical or angular; peristome single (of thirty-two or sixty-four teeth); calyptra cucullate.

Family *Buxbaumiaceæ.* Leaves thick, costate; spore-fruit large, oblique, sessile or short-stalked; peristome double (the outer rudimentary, the inner of sixteen or thirty-two teeth); calyptra very small, conical.

B. *Pleurocarpæ. Spore-fruits lateral, in leaf axils.*

Family *Fontinallaceæ.* Aquatic plants, with thin ecostate leaves; spore-fruit sessile, emersed; peristome double (of sixteen outer and sixteen inner teeth); calyptra conical or cucullate.

Family *Neckeraceæ.* Leaves mostly costate, areolation minute, rhomboidal or short-linear; spore-fruit erect, symmetrical (or curved), generally emersed; peristome single or double (or none).

Family *Leucodontaceæ.* Leaves sub-scarious, usually costate, areolation narrowly linear or vermicular; spore-fruit soft, oval-oblong, erect, more or less long-stalked; peristome single or double; calyptra cucullate.

Family *Hookeriaceæ.* Plants small and soft, with narrow or broad leaves, having a large areolation; spore-fruit long-stalked, sub-erect, nodding or horizontal; peristome large, double; calyptra conical or mitrate.

Family *Fabroniaceæ.* Plants very small, with crowded leaves, having a loose rhomboidal areolation; spore-fruit ovate, erect, short-stalked; calyptra cucullate.

Family *Leskeaceæ.* Leaves costate, areolation minute, hexagonal; spore-fruit symmetrical, erect or curved; peristome double (of sixteen outer and sixteen inner teeth); calyptra cucullate.

Family *Orthotheciaceæ.* Leaves costate, bicostate, or ecostate, areolation narrowly rhomboidal or linear; spore-fruit erect or sub-inclined; peristome double; calyptra from small to large.

Family *Hypnaceæ.* Leaves costate or ecostate, areolation narrowly rhomboidal or linear; spore-fruit long-stalked, nodding or horizontal; peristome double (of sixteen outer and sixteen inner teeth); calyptra cucullate.

Branch V. **PTERIDOPHYTA.** Pteridophytes. Fernworts.

Masses of cells, forming a flat plant usually with rhizoids (oöphore); sexual reproduction by the union of two protoplasts and the formation of a stem with roots and spore-bearing leaves (sporophore). See FERNWORTS.

Class 11. FILICINÆ. The Ferns. Stems of the sporophore solid, leaves usually large, with broadly expanded blade, and elongated petioles. Species about 3,500.

Order OPHIOGLOSSACEÆ. Adder's-tongues. Spores developed from cells in the tissue of the leaf; leaves erect in the bud (not circinate).

Family *Ophioglosseæ.* With the characters of the order.

Order MARATTIACEÆ. Ringless Ferns. Spores developed in external sporangia, originating by the division of internal

cells of the lower side of the leaf; leaves circinate in the bud.

Family *Angiopterideæ*. Sporangia five to twenty, separate, sessile in an elongated sorus, splitting longitudinally on the inner side.

Family *Marattieæ*. Sporangia four to fifteen, sessile or short-stalked, united into elongated or circular sori, splitting longitudinally on the inner side.

Family *Danæaceæ*. Sporangia sessile, many, united in elongated sori, opening by an apical pore.

Order FILICES. True Ferns. Spores developed from cells in specially modified hairs (sporangia), usually on the under side of the leaf, and collected into sori; leaves circinate.

Family *Osmundaceæ*. Sporangia globose, mostly stalked with but a trace of a ring, splitting vertically.

Family *Gleicheniaceæ*. Sporangia globose, sessile, with a horizontal ring, splitting vertically.

Family *Schizæaceæ*. Sporangia ovate or sub-globose, sessile, with an apical horizontal ring, splitting vertically.

Family *Hymenophyllaceæ*. Sporangia compressed, sessile upon an elongated involucrate marginal receptacle; ring horizontal or oblique; splitting vertically.

Family *Cyatheaceæ*. Tree-ferns. Sporangia compressed, sessile on a low involucrate receptacle on the leaf surface; ring vertical or oblique; splitting transversely.

Family *Polypodiaceæ*. Sporangia compressed, mostly stalked, collected in sori which are often covered or surrounded by an involucre (indusium); ring vertical; splitting transversely.

Order HYDROPTERIDEÆ. Water-ferns. Spores of two kinds (macrospores and microspores), developed from cells in sporangia inclosed in modified leaves ("conceptacles").

Family *Salviniaceæ*. Each conceptacle containing but one kind of spore. Small, floating aquatics.

Family *Marsiliaceæ*. Each conceptacle containing both kinds of spores. Semi-aquatic plants rooting in the mud.

Class 12. EQUISETINÆ. The Horsetails or Joint Rushes. Stems of the sporophore hollow, jointed, the joints solid; leaves rudimentary, whorled. Species, 20.

Order EQUISETACEÆ. Spores developed in sporangia on the under surface of modified (peltate) leaves at the summit of the stem.

Family *Equisetaceæ*. With the characters of the order.

Class 13. LYCOPODINÆ. The Lycopods. Stems of the sporophore solid, dichotomously branched, leaves small, narrow, and scattered or crowded. Species, 482.

Order LYCOPODIACEÆ. Club-mosses. Leafy, branching plants; sporangia single in the axils of the small upper leaves; spores all alike.

Family *Lycopodiaceæ*. With the characters of the order.

Order SELAGINELLEÆ. Little Club-mosses. Leafy, branching plants; sporangia single in the axils of the small upper leaves; spores of two kinds, viz., macrospores and microspores.

Family *Selaginellaceæ*. With the characters of the order.

Order ISOETACEÆ. Quillworts. Very short-stemmed plants; sporangia in the axils of the narrow, rush-like leaves; spores of two kinds, viz., macrospores and microspores.

Family *Isoetaceæ*. With the characters of the order.

Branch VI. **ANTHOPHYTA**. Anthophytes. Flowering Plants.

Oöphore small, permanently inclosed within the spore-wall; sexual reproduction by the union of two protoplasts and the formation of a sporophore consisting of roots, stem, and leaves, some of the latter spore-bearing (forming the "flowers"); microspores (pollen-cells) free, macrospores permanently inclosed in the sporangium. See ANTHOPHYTES.

Class 14. GYMNOSPERMÆ. The Gymnosperms. Spore-bearing leaves (carpels) of the sporophores open; seeds naked. Species, 420.

Order CYCADEÆ. The Cycads. Stem simple or rarely branched, not resinous; pith large; leaves large, pinnately compound, crowded upon the upper part of the stem. See CYCADS.

Family *Cycadaceæ*. Carpellary leaves developed on the main axis.

Family *Zamiaceæ*. Carpellary leaves developed on axillary, deciduous axes.

Order CONIFERÆ. The Conifers. Stem branched, usually resinous; pith slender; leaves small, simple, mostly crowded upon the stem, sometimes scattered. See CONIFERS.

Family *Taxaceæ*. Carpellary leaves solitary; seeds with a fleshy aril.

Family *Pinaceæ*. Carpellary leaves clustered on an axis, forming a cone; seeds without an aril.

Order GNETACEÆ. The Joint Firs. Stem usually branched, not resinous; pith slender; leaves (mostly) small, opposite, upon elongated internodes, or large, and only two on a short thick stem. See JOINT FIRS.

Family *Gnetaceæ*. With the characters of the order.

Class 15. ANGIOSPERMÆ. The Angiosperms. Spore-bearing leaves (carpels) of the sporophore folded so as to inclose the ovules in a cavity, thus constituting the pistil; seeds inclosed. Species about 100,000.

The relationship of the orders of this class may be indicated by the accompanying diagram (Fig. 3). The orders

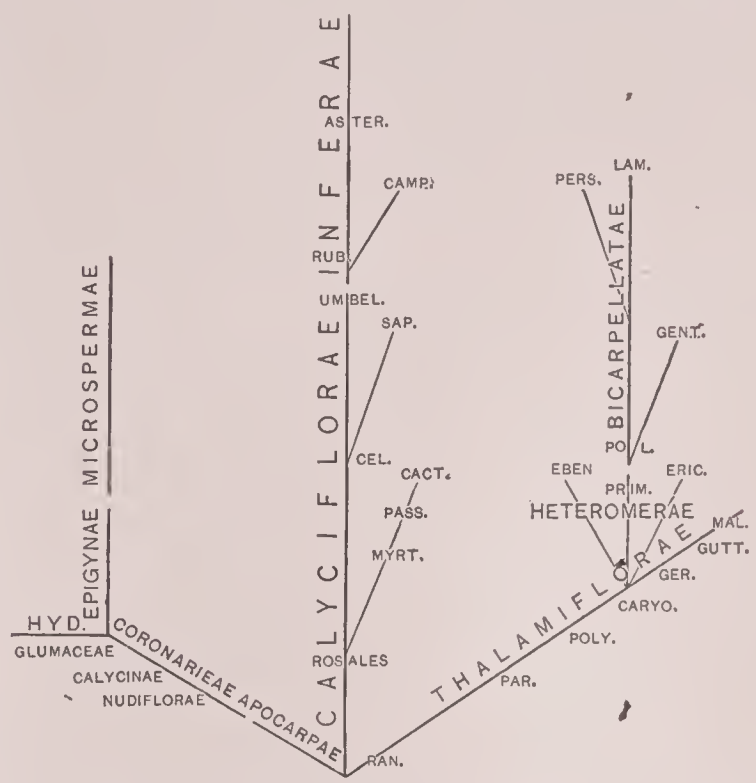

FIG. 3.—Diagram showing the relationship of the orders of the Angiosperms.

on the left constitute the Monocotyledons, those in the center and to the right the Dicotyledons. There are thus several diverging genetic lines from a common point of origin.

Sub-class MONOCOTYLEDONEÆ. The Monocotyledons. Leaves of young sporophore alternate; leaves of mature sporophore usually parallel-veined; fibrovascular bundles of the stems scattered, not arranged in rings. See MONOCOTYLEDONS.

Order APOCARPÆ. Pistils separate, superior to all other parts of the flower.

Family *Alismaceæ*. Aquatic or paludose herbs, with mostly radical, often large, leaves; flowers small to large; perianth in two whorls of three leaves each (calyx and corolla). See WATER-PLANTAIN FAMILY.

Family *Triurideæ*. Very small, pale, leafless plants growing in wet places in tropical countries.

Family *Naiadaceæ*. Aquatic or paludose herbs, with mostly alternate stem-leaves; flowers mostly small and inconspicuous; perianth none, or of one to six leaves in one or two whorls. See PONDWEED FAMILY.

Order CORONARIEÆ. Pistils united (usually three), forming a compound pistil, superior; flower-leaves (usually six in two whorls) delicate and corolla-like.

Family *Roxburghiaceæ*. Pistil one-celled; stamens four; perianth of two similar whorls, each of two similar leaves.

Family *Liliaceæ*. Pistil mostly three-celled; stamens six; perianth of two similar whorls, each of three similar leaves. See LILY FAMILY.

Family *Pontederiaceæ*. Aquatic herbs, with a three or one celled pistil; stamens six or three; perianth of two similar whorls, each of three similar or dissimilar leaves.

Family *Philydraceæ*. Pistil three-celled; stamen one; perianth of two similar whorls, each of two dissimilar leaves.

Family *Xyridaceæ*. Rush-like plants, with a one-celled or incompletely three-celled pistil; stamens three; perianth of two dissimilar whorls, each of three similar leaves.

Family *Mayaceæ*. Slender, creeping, moss-like plants, with one-celled pistil; stamens three; perianth of two dissimilar whorls, each of three similar leaves.

Family *Commelinaceæ*. Succulent herbs, with a three or

two-celled pistil; stamens six; perianth of two dissimilar whorls of three similar leaves.

Family *Rapateaceæ*. Tall, sedge-like marsh-herbs, with a three-celled pistil; stamens six, in pairs; perianth of two dissimilar whorls, each of three similar leaves.

Order NUDIFLORÆ. Compound pistil, tricarpellary, superior; flower-leaves reduced to scales or entirely wanting.

Family *Pandanaceæ*. Shrubs or trees with spirally crowded, narrow, stiff leaves on the ends of the branches; pistil one-celled; ovules one or three.

Family *Cyclanthaceæ*. Mostly herbaceous plants, with broad, petioled leaves having parallel venation; pistil one-celled; ovules many, on four parietal placentæ.

Family *Typhaceæ*. Aquatic or padulose herbs, with linear, sheathing leaves; pistil one-celled; ovule one. See CAT-TAIL.

Family *Aroideæ*. Mostly herbaceous plants, with broad, petioled leaves, having reticulate venation; pistil one to four celled; ovules one or more.

Family *Lemnaceæ*. Very small, floating, aquatic herbs; pistil one-celled; ovules one or more.

Order CALYCINÆ. Compound pistil tricarpellary, superior; flower-leaves reduced to rigid or herbaceous scales.

Family *Flagellarieæ*. Erect or climbing herbs, with long, narrow leaves; pistil three-celled; ovules solitary; fruit a one or two seeded berry.

Family *Juncaceæ*. The Rushes. Herbs with narrow leaves; pistil one to three celled; ovules solitary or many; fruit a dry three-valved pod. See RUSH.

Family *Palmaceæ*. The Palms. Trees or shrubs with compound leaves; pistil one to three celled; fruit a one-seeded berry or drupe (rarely two to three seeded). See PALM FAMILY.

Order GLUMACEÆ. Compound pistil reduced to one or two carpels (rarely tricarpellary); ovules solitary; flower-leaves reduced to small scales, or entirely wanting.

Family *Eriocauleæ*. Rush-like herbs, with flowers in close heads; perianth segments six or less, small; pistil three or two celled; ovules orthotropous, pendulous.

Family *Centrolipedeæ*. Small rush-like herbs, with flowers in spikes or heads; perianth none; pistil one to three celled; ovules orthotropous, pendulous.

Family *Restiaceæ*. Rush-like herbs or undershrubs, with spiked, racemed, or panicled flowers; perianth segments six or less, chaffy; pistil one to three celled; ovules orthotropous, pendulous.

Family *Cyperaceæ*. The Sedges. Grass-like herbs, with three-ranked leaves; perianth segments bristly, or none; pistil one-celled; ovules anatropous, erect. See SEDGE FAMILY.

Family *Gramineæ*. The Grasses. Mostly erect herbs, with hollow, jointed stems, and two-ranked leaves; perianth segments of two to six thin scales, or none; pistil one-celled; ovules anatropous, ascending. See GRASSES.

Order HYDRALES. Compound tricarpellary pistil inferior to all other parts of the flower; flower-leaves in each whorl alike in shape (flower regular); seeds without endosperm.

Family *Hydrocharideæ*. Small aquatic herbs, mostly inhabiting the fresh waters of temperate climates.

Order EPIGYNÆ. Compound tricarpellary pistil inferior; flower-leaves in each whorl mostly alike in shape (flower regular); seeds with endosperm.

Family *Dioscoreaceæ*. Mostly twining herbs, with broad, petioled, longitudinally veined leaves; pistil three-celled; ovules two in each cell; stamens six.

Family *Taccaceæ*. Stemless herbs, with broad, pinnately parallel-veined leaves; pistil one-celled; ovules many; stamens six.

Family *Amaryllidaceæ*. Leaves narrow, or the blades broad with longitudinal veins; pistil three-celled; ovules many; stamens six (or three). See AMARYLLIS FAMILY.

Family *Iridaceæ*. Leaves sword-shaped; pistil three-celled; ovules many; stamens three. See IRIS FAMILY.

Family *Hæmodoraceæ*. Leaves sword-shaped; pistil three-celled; ovules one to many; stamens six.

Family *Bromeliaceæ*. Leaves mostly rosulate; external perianth-whorl calycine; pistil three-celled; ovules many; stamens six. See BROMELIA FAMILY.

Family *Scitamineæ*. Leaves mostly ample, pinnately parallel veined; external perianth-whorl calycine; pistil three-celled or becoming one-celled; stamens mostly one (rarely five). See BANANA.

Order MICROSPERMÆ. Compound tricarpellary pistil inferior; flower-leaves in each whorl mostly unlike in shape (flower irregular); seeds without endosperm.

Family *Burmanniaceæ*. Flowers regular; stamens three or six.

Family *Orchidaceæ*. The Orchids. Flowers irregular; stamens one or two. See ORCHIDS.

Sub-class DICOTYLEDONEÆ. The Dicotyledons. Leaves of young sporophore opposite; leaves of mature sporophore usually reticulate-veined; fibrovascular bundles of the stems in one or more rings.

A. CHORIPETALÆ. *Inner perianth-whorl (corolla) of separate leaves (petals), frequently rudimentary or wanting; ovules usually with two coats.*

Order THALAMIFLORÆ. Outer perianth-whorl (calyx) usually of separate leaves (sepals), and with the other parts of the flower inserted on the flower axis (torus).

Sub-order RANALES. Pistils one to many, monocarpellary (or rarely united); stamens generally indefinite; embryo mostly small in copious endosperm.

Family *Ranunculaceæ*. Mostly herbs with alternate leaves; petals present in one whorl or absent; sepals deciduous. See CROWFOOT.

Family *Dilleniaceæ*. Mostly shrubs and trees, with alternate leaves; petals present, in one whorl; sepals persistent.

Family *Calycanthaceæ*. Shrubs with opposite leaves; petals present in many whorls; seeds without endosperm. See CALYCANTHUS.

Family *Magnoliaceæ*. Shrubs and trees with alternate leaves, and usually large flowers; petals present in one to many whorls; receptacle usually elongated. See MAGNOLIA FAMILY.

Family *Anonaceæ*. Shrubs and trees with alternate leaves; petals present in two whorls of three each; endosperm ruminated. See PAPAW.

Family *Myristicaceæ*. Trees or shrubs with alternate leaves, and small and inconspicuous diœcious flowers; petals absent; pistil one (or a second rudiment), one-seeded; endosperm ruminated. See NUTMEG.

Family *Monimiaceæ*. Trees and shrubs with opposite or whorled leaves and diclinous flowers; petals absent; pistils many, one-ovuled, imbedded in the receptacle.

Family *Chloranthaceæ*. Mostly trees and shrubs with opposite leaves and small flowers. No perianth whatever; pistil one, with one ovule.

Family *Menispermaceæ*. Twining shrubs with alternate leaves and small diclinous flowers; petals present in two whorls.

Family *Berberidaceæ*. Mostly shrubs with alternate leaves and perfect flowers. Petals usually present in one to three whorls: pistil one (rarely more) with many ovules. See BARBERRY FAMILY.

Family *Nymphæaceæ*. Aquatic herbs with floating leaves; petals present in one to many whorls; pistils several or united. See WATER-LILY FAMILY.

Sub-order PARIETALES. Pistil of two or more united carpels, mostly one-celled, with parietal placentæ; stamens indefinite or definite; endosperm none or copious.

Family *Sarraceniaceæ*. Herbs with pitcher-shaped leaves, sepals four to five, petals five or none; stamens indefinite; pistil three to five carpellary. See PITCHER-PLANTS.

Family *Papaveraceæ*. Mostly milky-juiced plants, with alternate leaves: sepals two to three, petals four or more (or none); stamens indefinite; pistil two to many carpellary. See POPPY FAMILY.

Family *Cruciferæ*. Herbs, rarely shrubs, with alternate (or opposite) leaves; sepals four, petals four; stamens six or four; pistil two-carpellary. See MUSTARD FAMILY.

Family *Capparidaceæ*. Herbs, shrubs, and trees with alternate (or opposite) leaves; sepals four, petals four (or none); stamens four (or many); pistil two to six carpellary.

Family *Resedaceæ*. Herbs and shrubs with scattered leaves; sepals four to eight, petals four to eight (or two, or none); stamens three to forty; pistil two to six carpellary. See MIGNONNETTE and WELD.

Family *Cistaceæ*. Herbs and shrubs with opposite (or alternate) leaves; sepals three to five; petals five; stamens many; pistil three to five carpellary.

Family *Violaceæ*. Herbs and shrubs with alternate (or opposite) leaves; sepals and petals five, irregular; stamens five; pistil three-carpellary. See VIOLET FAMILY.

Family *Canellaceæ*. Aromatic trees with alternate leaves; sepals four to five; petals four to five (or none); stamens twenty to thirty; pistil two to five carpellary.

Family *Bixaceæ*. Shrubs and trees with alternate leaves; sepals three to seven; petals various (or none); stamens indefinite; pistil two to many carpellary.

Family *Samydaceæ*. Trees and shrubs with alternate leaves; sepals three to seven; petals three to seven (or none); stamens definite or indefinite; pistils three to five carpellary.

Family *Lacistemaceæ*. Shrubs and trees with alternate leaves; perianth none; stamen one; pistil three or two carpellary.

Family *Nepenthaceæ*. Undershrubs with pitcher-shaped leaves; sepals four or three; petals none; stamens four to sixteen; pistil four to three carpellary. See PITCHER-PLANTS.

Sub-order POLYGALALES. Pistil mostly of two united carpels, two-celled; stamens as many or twice as many as the petals; seeds endospermous.

Family *Pittosporaceæ*. Trees and shrubs with alternate leaves; sepals, petals, and stamens five each. See PITTOSPORUM FAMILY.

Family *Tremandraceæ*. Small shrubs with alternate, opposite, or whorled leaves; sepals and petals three, four, or five each; stamens twice as many.

Family *Polygalaceæ*. Herbs, shrubs, and trees with alternate leaves; sepals five; petals three to five; stamens usually eight.

Family *Vochysiaceæ*. Shrubs and trees with opposite or whorled leaves; sepals five; petals one, three, or five; stamens several, usually but one fertile.

Sub-order CARYOPHYLLALES. Pistil usually of three or more united carpels, mostly one-celled, with a free central placenta and many ovules (sometimes with parietal placentæ, or reduced to a one-celled, one-ovuled ovary); stamens as many or twice as many as the petals; seeds endospermous, usually with a curved embryo.

Family *Frankeniaceæ*. Herbs and undershrubs with opposite leaves; petals four to five, long-stalked; ovules many on two to four parietal placentæ.

Family *Caryophyllaceæ*. Herbs (and shrubs) with opposite or whorled leaves; petals three to five, stalked or not; ovules many on a central placenta. See PINK FAMILY.

Family *Portulacaceæ*. Mostly succulent herbs, with alternate leaves; petals four to five; ovules many on a central placenta. See PURSLANE FAMILY.

Family *Tamariscaceæ*. Shrubs and herbs with minute alternate leaves; petals five; ovules many on central or parietal placentæ. See TAMARISK FAMILY.

Family *Salicaceæ*. Shrubs and trees with alternate leaves; perianth none; ovules many on two to four parietal placentæ. See WILLOW FAMILY.

Family *Ficoideæ*. Herbs and undershrubs with alternate, opposite, or whorled leaves; petals indefinite or none; seeds many on parietal placentæ, or one, and erect.

Family *Nyctaginaceæ*. Herbs and shrubs with opposite leaves; petals none; sepals petaloid; ovule one, erect.

Family *Illicebraceæ*. Herbs (and shrubs) with opposite leaves; petals scale-like or none; ovule one, erect or pendulous.

Family *Amaranthaceæ*. Herbs (and shrubs) with mostly alternate leaves; sepals three to five, dry and scarious; petals none; ovules one or more, basal, campylotropous. See AMARANTH FAMILY.

Family *Chenopodiaceæ*. Herbs, shrubs (and trees) with mostly alternate leaves; sepals five or less or none, greenish or succulent; petals none; ovule one, basal, campylotropous. See CHENOPODS.

Family *Phytolaccaceæ*. Herbs, shrubs, and trees with usually alternate leaves; petals none (or four to five); carpels several, distinct or nearly so; one-ovuled. See POKEWEED FAMILY.

Family *Batideæ*. Shrubs with opposite leaves; petals none; ovary four-celled; ovules solitary, erect.

Family *Polygonaceæ*. Herbs, shrubs (and trees) with alternate leaves; petals none; ovule one, erect, orthotropous. See BUCKWHEAT FAMILY.

Sub-order GERANIALES. Pistil of several carpels, on the more or less enlarged, annular or glandular base (disk) of the receptacle; ovules one to two (or many), mostly pendulous.

Family *Linaceæ*. Herbs and shrubs with alternate, simple leaves; pistil three to five celled; endosperm fleshy or none. See FLAX FAMILY.

Family *Humiriaceæ*. Trees with alternate, simple leaves; pistil five to seven celled; endosperm copious.

Family *Malpighiaceæ*. Trees and shrubs with usually opposite, simple or lobed leaves; pistil tricarpellary; endosperm none.

Family *Zygophyllaceæ*. Herbs and shrubs with usually opposite, compound leaves; pistil lobed, four to five celled; endosperm copious or none.

Family *Geraniaceæ*. Herbs, shrubs, and trees with opposite or alternate compound (or simple) leaves; torus elongated; pistil lobed, three to five celled; endosperm sparse or none. See GERANIUM FAMILY.

Family *Rutaceæ*. Herbs, shrubs, and trees with glandular-dotted, opposite, simple or compound leaves; pistil lobed, four to five celled; endosperm fleshy or none. See RUE.

Family *Simarubaceæ*. Trees and shrubs with generally alternate, non-glandular, simple or compound leaves; pistil lobed, one to five celled; endosperm fleshy or none.

Family *Ochnaceæ*. Shrubs and trees with alternate, coriaceous, simple leaves; pistil lobed, one to ten celled; endosperm fleshy or none.

Family *Burseraceæ*. Balsamic trees and shrubs with alternate, compound leaves; pistil two to five celled; endosperm none.

Family *Meliaceæ*. Trees and shrubs with alternate, compound leaves; pistil three to five celled; endosperm present or none.

Family *Chailletiaceæ*. Trees and shrubs with alternate, simple leaves; pistil two to three celled; endosperm none.

Sub-order GUTTIFERALES. Pistil mostly of two or more carpels, two-celled, with axile placentæ; stamens usually indefinite; endosperm usually wanting.

Family *Elatineæ*. Small marsh-herbs or undershrubs, with small, opposite or whorled leaves; inflorescence axillary; petals imbricated; stamens four to ten.

Family *Hypericaceæ*. Herbs, shrubs (and trees) with opposite or whorled, glandular dotted leaves; inflorescence dichotomous or paniculate; petals contorted or imbricated; stamens in three to five clusters. See ST. JOHN'S-WORT FAMILY.

Family *Guttiferæ*. Trees and shrubs with opposite or whorled leaves; inflorescence often trichotomous; petals imbricated or contorted.

Family *Ternstrœmiaceæ*. Trees and shrubs usually with alternate leaves; inflorescence various; petals imbricated. See TEA FAMILY.

Family *Dipterocarpeæ*. Trees and shrubs with alternate leaves; inflorescence panicled; petals contorted, fruiting calyx enlarged in fruit.

Family *Chlænaceæ*. Trees and shrubs with alternate leaves; inflorescence dichotomous; petals contorted.

Sub-order MALVALES. Pistil usually of three to many carpels with as many cells (sometimes greatly reduced); ovules few; stamens indefinite, monadelphous, branched, or by reduction separate and few; endosperm present or absent.

Family *Malvaceæ*. Herbs, shrubs, and trees with alternate leaves; flowers perfect, with petals; stamens monadelphous, one-celled; pistil five to many celled; endosperm little or none. See MALLOW FAMILY.

Family *Sterculiaceæ*. Trees and shrubs with alternate leaves; flowers perfect, or diclinous, with or without petals; stamens monadelphous or polyadelphous, two-celled; pistils four to many celled; endosperm present or none.

Family *Tiliaceæ*. Trees, shrubs (and herbs) with mostly alternate leaves; flowers mostly perfect, with petals; stamens polyadelphous or free two-celled; pistil two to ten celled; endosperm present or none. See LINDEN.

Family *Euphorbiaceæ*. Herbs, shrubs, and trees, mostly with a milky juice, and alternate or opposite leaves; flowers diclinous, with a perianth of one or two whorls, or none; stamens two-celled, free or united; pistil usually three-celled; endosperm copious. See SPURGEWORTS.

Family *Balanopseæ*. Trees and shrubs with alternate leaves; flowers diœcious, apetalous, the staminate in catkins, the pistillate solitary, producing acorn-like, two-celled, two-seeded fruits; seeds endospermous.

Family *Empetraceæ*. Heath-like shrubs with small leaves; flowers small, mostly diœcious, solitary or in heads; petals present; stamens two or three, two-celled; pistil two to many celled; seeds solitary, endospermous.

Family *Urticaceæ*. Herbs, shrubs, and trees with alternate (or opposite) leaves; flowers mostly diclinous, without petals; stamens few, two-celled; pistil monocarpellary, one-celled, mostly one-seeded; endosperm none. See NETTLEWORTS.

Family *Platanaceæ*. Trees with alternate leaves and monœcious flowers in globose heads; perianth none; pistil one-celled, one-ovuled; endosperm minute. See PLANE-TREE FAMILY.

Family *Leitneriaceæ*. Shrubs with alternate leaves and

diœcious flowers in eatkins; perianth minute or none; pistil one-celled, one-ovuled; endosperm minute.

Family *Ceratophyllaceæ*. Aquatic herbs with vertieillate, divided leaves; flowers diœcious; perianth none; pistil one-eelled, one-ovuled; endosperm none.

Family *Piperaceæ*. Herbs, shrubs, and trees with alternate (or opposite) leaves; flowers perfect or diclinous, mostly spieate; perianth none; pistil one-eelled, one-ovuled; endosperm present. See PIPERACEÆ.

Family *Podostemaceæ*. Small, aquatie, sometimes thallose plants; flowers perfeet or dielinous; perianth none; pistil one to three eelled; ovules many; endosperm none.

Order CALYCIFLORÆ. Calyx usually of united sepals; petals and stamens inserted on the ealyx or the adherent disk; ovary mostly inferior.

Sub-order ROSALES. Flowers usually perfeet, regular or irregular; pistils separate or more or less united, sometimes united with the ealyx tube; styles usually distinet.

Family *Connaraceæ*. Trees and shrubs with alternate, compound leaves; stamens definite; pistils one to five, free; ovules two, aseending orthotropous.

Family *Rosaceæ*. Herbs, shrubs, and trees with mostly alternate leaves; stamens usually indefinite; pistils one to many, free (or coalesced and inferior); ovules usually two, anatropous. See ROSE.

Family *Mimosaceæ*. Trees, shrubs (and herbs) with alternate, pinnately compound leaves, often reduced to phyllodes; flowers regular; petals valvate; stamens mostly indefinite, usually free; pistils monocarpellary, usually one (rarely five to fifteen); ovules anatropous.

Family *Cæsalpiniaceæ*. Trees, shrubs, and herbs with mostly alternate, pinnately compound leaves; flowers mostly irregular; petals imbricate; stamens ten or less, usually free; pistil one, monoearpellary; ovules anatropous.

Family *Papilionaceæ*. Trees, shrubs, and herbs with mostly alternate, simple or compound, often tendril-bearing leaves; flowers irregular (papilionaceous); petals imbricate; stamens usually ten, commonly monadelphous or diadelphous; pistil one, monocarpellary; ovules amphitropous.

NOTE.—The three foregoing families are usually considered to be sub-families of the LEGUMINOSÆ (*q. v.*).

Family *Saxifragaceæ*. Herbs, shrubs, and trees with alternate or opposite leaves; stamens mostly definite; pistil usually eompound; ovules indefinite. See SAXIFRAGE FAMILY.

Family *Crassulaceæ*. Mostly fleshy herbs, with opposite or alternate leaves; stamens definite; pistils several, free or little united; ovules indefinite.

Family *Droseraceæ*. Gland-bearing marsh-herbs; stamens mostly definite; pistil synearpous, one to three celled, superior; ovules many, on basal, axile or parietal placentæ. See DROSERA and INSECTIVOROUS PLANTS.

Family *Hamamelidaceæ*. Shrubs and trees with mostly alternate leaves; stamens few or many; pistil bicarpellary, its ovary inferior; ovules solitary or many.

Family *Bruniaceæ*. Heath-like shrubs with small leaves; stamens definite; pistil mostly three-eelled, inferior to superior; ovules one to many, pendulous.

Family *Halorageæ*. Aquatic or terrestrial herbs with mostly alternate leaves; pistil one to four eelled, inferior; ovules solitary, pendulous.

Sub-order MYRTALES. Flowers regular or nearly so, usually perfeet; pistil of united carpels, usually inferior; placentæ axile or apical (rarely basal); style one (rarely several); leaves simple, usually entire.

Family *Rhizophoraceæ*. Trees and shrubs with mostly opposite leaves; stamens two to four times the number of petals; pistil two to six eelled, usually inferior; ovules two, pendulous. See MANGROVE.

Family *Combretaceæ*. Trees and shrubs with opposite or alternate leaves; stamens usually definite; pistil one-celled, inferior; ovules two to six, or solitary, pendulous.

Family *Myrtaceæ*. Trees and shrubs with opposite or alternate leaves; stamens indefinite; pistil two to many celled, inferior; ovules two to many, placentæ basal or axile. See MYRTACEÆ.

Family *Melastomaceæ*. Herbs, shrubs, and trees with mostly opposite leaves; stamens usually double the number of petals; pistil two to many celled, free or adherent to the calyx tube; ovules minute, numerous, on axile or parietal placentæ.

Family *Lythraceæ*. Herbs, shrubs, and trees usually with opposite leaves, and four-angled branches; stamens definite or indefinite; pistil two to six celled, free; ovules numerous, on axile placentæ.

Family *Onagraceæ*. Herbs (shrubs and trees) with opposite or alternate leaves: stamens one to eight, rarely more; pistil usually four-eelled, inferior; ovules one to many, on axile placentæ.

Family *Aristolochiaceæ*. Herbaceous or shrubby plants with alternate leaves; petals absent; stamens six, rarely more; pistil four or six celled, inferior; ovules numerous, on axile (or protruding parietal) placentæ. See BIRTHWORTS.

Family *Cytinaceæ*. Fleshy, parasitic herbs, leafless or nearly so; petals four or none; stamens eight to many; pistil one-eelled, or imperfeetly many-celled, inferior; ovules minute, very numerous, on parietal or pendulous-folded placentæ. See VINE RAPES.

Sub-order PASSIFLORALES. Flowers usually regular, perfect or diclinous; pistil syncarpous, one-celled, its ovary usually inferior; placentæ parietal; styles free or eonnate; leaves ample, entire, lobed.

Family *Loasaceæ*. Herbs with opposite or alternate leaves; flowers perfect; sepals and petals dissimilar; stamens indefinite; endosperm fleshy or none.

Family *Turneraceæ*. Herbs and shrubs with alternate leaves; flowers perfect; sepals and petals dissimilar; stamens definite; ovary free; endosperm copious.

Family *Passifloraceæ*. Climbing herbs, shrubs (and trees) with alternate leaves; flowers perfect; sepals and petals similar; stamens definite; ovary free; endosperm fleshy. See PASSION-FLOWER FAMILY.

Family *Cucurbitaceæ*. Mostly climbing or prostrate herbs and undershrubs, with alternate leaves; flowers diclinous; stamens definite (usually three); ovary inferior; endosperm none. See CUCUMBER FAMILY.

Family *Begoniaceæ*. Mostly herbs with alternate leaves; flowers diclinous; stamens indefinite; ovary inferior, usually triangular; endosperm little or none. See BEGONIACEÆ.

Family *Datiscaceæ*. Herbs or trees with alternate leaves; flowers mostly dielinous; stamens four to many; ovary inferior, usually gaping at the top; endosperm seanty.

Sub-order CACTALES. Flowers regular or nearly so, and perfect; pistil syncarpous, one-celled, with parietal placentæ, its ovary inferior; style divided at the apex; endosperm present or none; embryo curved. Fleshy-stemmed, mostly leafless plants.

Family *Cactaceæ*. With the characters of the sub-order. See CACTUS FAMILY.

Sub-order CELASTRALES. Flowers usually regular; disk of the reeeptacle from glandular to annular or tumid, sometimes adnate to the calyx tube or the pistil, or rudimentary or entirely wanting; pistil one to many celled (rarely apoearpous); ovules one to three, pendulous or erect; endosperm present or none.

Family *Olacaceæ*. Trees and shrubs with usually alternate simple leaves; disk free or adnate to the calyx; petals present; pistil one to three celled, ovules two or three, pendulous; endosperm fleshy.

Family *Ilicineæ*. Trees and shrubs with alternate or opposite, simple leaves; disk obsolete; petals present; pistil three to many eelled; ovule one, pendulous; endosperm fleshy. See HOLLY FAMILY.

Family *Celastraceæ*. Shrubs and trees with usually alternate, simple leaves; disk fleshy; petals present; pistil two to five celled; ovules usually two, erect or pendulous; endosperm fleshy. See SPINDLE-TREE FAMILY.

Family *Stackhousieæ*. Herbs with simple, alternate leaves; disk thin, on the base of the calyx; petals present; ovary two to five celled; ovule one, erect; endosperm fleshy.

Family *Rhamnaceæ*. Trees and shrubs with usually alternate simple leaves; disk adnate to the ealyx; petals present; pistil two to four eelled; ovules one or two, erect; endosperm fleshy. See BUCKTHORN.

Family *Ampelideæ*. Shrubs and trees with alternate, simple or compound leaves; disk adnate to the ealyx; petals eohcrent; valvate; pistil two-celled, two-ovuled (or three to six eelled, one-ovuled); endosperm often ruminate. See VINE FAMILY.

Family *Lauraceæ*. Aromatic trees and shrubs, with alternate, simple leaves; disk none; petals none; pistil one-celled; ovule one, pendulous; endosperm none. See LAUREL FAMILY.

Family *Proteaceæ*. Shrubs, trees (and herbs) with scattered, simple, usually coriaceous leaves; disk none; petals none; pistil one-eelled; ovules one, ereet or pendulous; endosperm little or none.

Family *Thymelæaceæ*. Shrubs, small trees (and herbs)

with scattered or opposite, usually coriaceous, simple leaves; disk none; petals none; pistil one-celled; ovule one, pendulous. See DAPHNE.

Family *Penæaceæ*. Evergreen, heath-like shrubs, with small, opposite leaves; disk none; petals none; pistil four-celled; ovules two, erect; endosperm none.

Family *Elæagnaceæ*. White- or brown-scurfy trees and shrubs, with alternate or opposite simple leaves; disk lining the perianth tube; petals none; pistil one-celled; ovule one, ascending; endosperm none or scanty. See ELÆAGNACEÆ.

Family *Santalaceæ*. Parasitic herbs, shrubs, and trees, with alternate or opposite simple leaves; disk epigynous; petals none; pistil one-celled; ovules two to five, pendulous; endosperm present.

Family *Loranthaceæ*. Parasitic herbs or shrubs, with opposite or alternate simple leaves, often reduced to bracts; disk epigynous; petals none; pistil one-celled, inferior; ovule one, erect; endosperm present. See MISTLETOE.

Family *Balanophoraceæ*. Parasitic, leafless herbs, monœcious or diœcious; disk none; petals none; pistil one-celled, inferior; ovule one, erect; endosperm present.

Sub-order SAPINDALES. Flowers usually regular, often much reduced; disk of the receptacle tumid, adnate to the calyx, lining its tube, or rudimentary, or entirely wanting; pistils one to several celled; ovules one or two, erect, ascending or pendulous; endosperm mostly none.

Family *Sapindaceæ*. Trees and shrubs with alternate (or opposite), mostly compound leaves; disk present or none; petals three to five, or none; pistil one to four celled; ovules one or two, ascending; endosperm usually none. See SOAPWORT.

Family *Sabiaceæ*. Trees and shrubs with alternate, simple, or compound leaves; disk small; petals present; pistil two or three celled; ovules one or two, horizontal or pendulous; endosperm none.

Family *Anacardiaceæ*. Trees and shrubs with alternate, usually compound leaves; disk usually annular; petals three to seven, or none; pistil one to five celled; ovules solitary, pendulous (or erect); endosperm scanty or none. See SUMACH FAMILY.

Family *Juglandaceæ*. Trees and shrubs with alternate, compound leaves; disk forming a cupule; petals none; pistil one-celled, inferior; ovule one, erect, orthotropous; endosperm none. See WALNUT FAMILY.

Family *Myricaceæ*. Shrubs and trees with alternate, simple leaves; disk none; petals none; pistil free, one-celled; ovule one, erect, orthotropous; endosperm none.

Family *Cupuliferæ*. Trees and shrubs with alternate, simple leaves; disk none; petals none; pistil two to six celled, inferior; ovules two, erect or pendulous; endosperm none. See OAK.

Family *Casuarinaceæ*. Shrubs and trees with striate stems, bearing whorls of reduced scale-like leaves; disk none; petals none; pistil one-celled; ovules two, lateral, half anatropous; endosperm none. (Treub's studies seem to indicate a nearer relationship of this family with the Gymnosperms.) See BEEFWOODS and CASUARINA.

Sub-order UMBELLALES. Flowers regular, usually perfect; stamens usually definite; pistil synearpous, one to many celled, its ovary inferior, ovule solitary, pendulous; styles free or united at the base; endosperm copious; embryo usually minute.

Family *Cornaceæ*. Shrubs and trees (rarely herbs) with usually opposite leaves; flowers umbellate, capitate, or corymbose; ovary two to four celled; fruit drupaceous. See CORNEL and DOGWOODS.

Family *Araliaceæ*. Trees, shrubs (and herbs) with alternate leaves; flowers in umbels, heads, or panicles; ovary two to fifteen celled; fruit a berry with a fleshy or dry exocarp. See GINSENG FAMILY.

Family *Umbelliferæ*. Herbs (shrubs and trees) with alternate leaves; flowers small, mostly umbellate; ovary two-celled; fruit splitting into two dry indehiscent mericarps. See UMBELLIFERS.

B. GAMOPETELÆ. *Leaves of inner perianth-whorl (corolla) grown together into one piece, sometimes wanting; ovules usually with but one coat.*

Order HETEROMERÆ. Pistil of three or more united carpels, its ovary generally superior; stamens as many or twice as many as the corolla lobes.

Sub-order PRIMULALES. Flowers regular, mostly perfect; stamens mostly opposite to the corolla lobes; ovary pluricarpellary, one-celled; with a free central placenta.

Family *Plumbaginaceæ*. Herbs with alternate or clustered leaves; stamens opposite to the petals; ovule one, basal, anatropous; fruit capsular; dehiscence valvate, or irregular.

Family *Plantaginaceæ*. Herbs with alternate or clustered leaves; stamens alternate with the petals; ovary mostly two-celled; ovules many; placentæ axile; fruit a circumscissile capsule. See PLANTAIN FAMILY.

Family *Primulaceæ*. Herbs with alternate or opposite, sometimes clustered, leaves; stamens opposite to the petals; ovules many; fruit a capsule dehiscing longitudinally from the apex, or circumscissile. See PRIMROSE FAMILY.

Family *Myrsinaceæ*. Trees and shrubs with alternate (or opposite) leaves; stamens opposite to the petals; ovules usually few; fruit a drupe or berry.

Sub-order ERICALES. Flowers regular, perfect; stamens alternate with the corolla lobes; cells of the ovary or placentæ two to many; seeds minute.

Family *Vacciniaceæ*. Shrubs and trees with mostly alternate, evergreen leaves; ovary inferior, two to ten celled; fruit fleshy or succulent; anthers dehiscing by an apical pore.

Family *Ericaceæ*. Shrubs and trees (a few herbs) with alternate, opposite or whorled, mostly evergreen leaves; ovary superior, two to twelve celled; fruit usually a capsule; anthers dehiscing by an apical pore. See HEATH FAMILY.

Family *Monotropeæ*. Pale, leafless, parasitic herbs; ovary superior; one to several celled; fruit a capsule; anthers dehiscing by a slit.

Family *Epacrideæ*. Shrubs and small trees with mostly alternate, evergreen leaves; ovary superior, mostly two to ten celled; fruit capsular or drupaceous; anthers dehiscing by a slit.

Family *Diapensiaceæ*. Low undershrubs with alternate, evergreen leaves; ovary superior, three-celled; fruit a capsule; anthers dehiscing by a slit. See DIAPENSIA.

Family *Lennoaceæ*. Parasitic leafless herbs; ovary superior, ten to fourteen carpellary, twenty to twenty-eight celled; ovules solitary; anthers dehiscing by a slit.

Sub-order EBENALES. Flowers regular, perfect, or diclinous; stamens opposite to the corolla lobes; ovary two to many celled; seeds mostly solitary or few, usually large.

Family *Sapotaceæ*. Trees and shrubs with mostly alternate leaves; flowers mostly perfect; stamens attached to the corolla; ovary superior. See STAR-APPLE FAMILY.

Family *Ebenaceæ*. Trees and shrubs with mostly alternate leaves; flowers mostly diœcious; stamens usually free from the corolla; ovary superior. See EBONY.

Family *Styracaceæ*. Trees and shrubs with alternate leaves; flowers mostly perfect; stamens attached to the corolla; ovary usually inferior. See STYRACACEÆ.

Order BICARPELLATÆ. Pistil of two united carpels, its ovary generally superior; stamens as many as the corolla lobes or less.

Sub-order POLEMONIALES. Corolla regular; stamens alternate with the corolla lobes and of the same number; leaves mostly alternate.

Family *Polemoniaceæ*. Herbs (and shrubs) with alternate or opposite leaves; corolla lobes contorted; ovary tricarpellary, three-celled; ovules two or more. See PHLOX FAMILY.

Family *Hydrophyllaceæ*. Herbs with radical or alternate (rarely opposite) leaves; corolla lobes imbricated (or contorted); ovary one or incompletely two celled; ovules two or more.

Family *Boraginaceæ*. Herbs, shrubs, and trees with alternate leaves; corolla lobes imbricated (or contorted); ovary bicarpellary, four-celled, four-lobed; ovules solitary. See BORAGE FAMILY.

Family *Convolvulaceæ*. Herbs, shrubs (and trees) with alternate leaves; corolla limb more or less plicate (rarely imbricated); ovary two (or three to five) celled; ovules few. See MORNING-GLORY FAMILY.

Family *Solanaceæ*. Herbs, shrubs (and trees) with alternate leaves; corolla limb more or less plicate (rarely imbricated); ovary mostly two-celled; ovules many. See NIGHTSHADE FAMILY.

Sub-order GENTIALALES. Corolla regular; stamens alternate with the corolla lobes and usually of the same number; leaves opposite (rarely alternate).

Family *Oleaceæ*. Shrubs and trees (rarely herbs) with mostly opposite leaves; corolla lobes valvate or wanting; stamens two (or four); ovary two-celled; ovules one to three. See OLIVE FAMILY.

Family *Salvadoraceæ*. Shrubs and trees with opposite,

undivided leaves; corolla lobes imbricated; stamens four; ovary two-celled; ovules two.

Family *Apocynaceæ*. Milky-juiced trees, shrubs, and herbs, with opposite, simple leaves; corolla lobes contorted or valvate; stamens five, with granular pollen; ovary two-celled or the carpels separating; ovules many. See APOCYNACEÆ and DOGBANE.

Family *Asclepiadaceæ*. Milky-juiced herbs and shrubs, with opposite (or alternate) leaves; corolla lobes contorted; stamens five, with agglutinated pollen; ovary of two separated carpels; ovules many. See MILKWEED FAMILY.

Family *Loganiaceæ*. Herbs, shrubs, and trees with mostly opposite, simple leaves; corolla lobes imbricated or contorted; stamens four or five (or indefinite); ovary two to four celled; ovules one to many.

Family *Gentianaceæ*. Mostly herbs, with usually opposite undivided leaves; corolla lobes contorted, valvate, or induplicate; stamens four or five (or indefinite); ovary usually one-celled; ovules many. See GENTIAN.

Sub-order PERSONALES. Corolla mostly irregular or oblique; stamens fewer than the corolla lobes, usually four or two; ovules numerous; fruit mostly capsular.

Family *Scrophulariaceæ*. Herbs (shrubs and small trees) with alternate, opposite, or whorled leaves; ovary two-celled with an axile placenta; seeds with endosperm. See FIGWORTS.

Family *Orobanchaceæ*. Leafless, parasitic herbs; ovary one-celled; placentæ parietal; ovules minute, numerous.

Family *Lentibutariaceæ*. Aquatic or marsh herbs with radical or alternate leaves; ovary one-celled with a globose basilar placenta. See BLADDERWORT.

Family *Columelliaceæ*. Trees and shrubs with opposite, evergreen leaves; ovary two-celled, with an axile placenta.

Family *Gesneraceæ*. Herbs, shrubs (and trees) with usually opposite leaves; ovary one-celled, with two parietal placentæ; seeds numerous; endosperm scanty or none.

Family *Bignoniaceæ*. Trees, shrubs (and herbs) with opposite or whorled leaves; ovary one or two celled, with parietal or axile placentæ; seeds numerous, without endosperm. See BIGNONIA FAMILY.

Family *Pedaliaceæ*. Herbs with mostly opposite leaves; ovary one, two, or four celled, with parietal or axile placentæ; seeds one to many, without endosperm.

Family *Acanthaceæ*. Herbs (shrubs and trees) with opposite leaves; ovary two-celled; placentæ axile; seeds two to many, without endosperm. See ACANTHUS FAMILY.

Sub-order LAMIALES. Corolla mostly irregular or oblique; stamens fewer than the corolla lobes, usually four or two; ovules mostly solitary; fruit indehiscent.

Family *Myoporineæ*. Shrubs and trees with mostly alternate leaves; flowers axillary.

Family *Selagineæ*. Heath-like shrubs, or perennial or annual low herbs, with mostly alternate leaves; flowers small, in terminal spikes or heads.

Family *Verbenaceæ*. Herbs, shrubs, and trees with usually opposite leaves; stigma usually undivided. See VERBENA FAMILY.

Family *Labiatæ*. Mostly aromatic herbs, shrubs (and trees), with opposite or whorled leaves; stigma usually bifid. See MINT FAMILY.

Order INFERÆ. Pistil of two or more united carpels, its ovary inferior; stamens usually as many as the corolla lobes, mostly attached to the corolla.

Sub-order RUBIALES. Flowers regular or irregular; stamens attached to the corolla; ovary two to eight celled; ovules two to many.

Family *Caprifoliaceæ*. Herbs (shrubs and small trees) with mostly opposite leaves; flowers usually irregular, with imbricated corolla lobes; style usually with a capitate, undivided stigma; fruit a berry. See HONEYSUCKLE FAMILY.

Family *Rubiaceæ*. Trees, shrubs, and herbs with opposite or whorled leaves; flowers usually regular, with valvate, contorted, or imbricated corolla lobes; style simple, bifid, or multifid; fruit a capsule, berry, or drupe. See MADDER FAMILY.

Sub-order CAMPANALES. Flowers mostly irregular; stamens usually free from the corolla; ovary one to many celled; ovules one to eight.

Family *Stylidaceæ*. Herbs with tufted, radical, and scattered stem-leaves; flowers usually irregular; stamens (two) connate with the style.

Family *Goodenovieæ*. Herbs (and shrubs) with alternate (or opposite) leaves; flowers usually irregular; stamens five, free from the style.

Family *Campanulaceæ*. Mostly milky-juiced herbs, shrubs (and small trees), with alternate (or opposite) leaves; flowers regular or irregular; stamens usually five, free from the style. See BELLWORTS.

Sub-order ASTERALES. Flowers regular or irregular; stamens attached to the corolla, their anthers usually connate; ovary one-celled, one-ovuled.

Family *Valerianaceæ*. Herbs (and shrubs) with opposite leaves; flowers cymose, corymbose, or solitary; anthers free; ovule pendulous.

Family *Dipsaceæ*. Herbs (and shrubs) with opposite or whorled leaves; flowers in involucrate heads; anthers free; ovule pendulous. See TEASEL FAMILY.

Family *Calyceraceæ*. Herbs with alternate leaves; flowers in involucrate heads; anthers connate; ovule pendulous.

Family *Compositæ*. Herbs, shrubs (and trees) with opposite or alternate leaves; flowers in involucrate heads; anthers connate; ovules erect. See COMPOSITES.

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CHARLES E. BESSEY.

Vegetable Physiology: See PHYSIOLOGY, VEGETABLE.

Vegetable Silk: See PULU and FIBER.

Vegetable Tissue: See BOTANY and HISTOLOGY, VEGETABLE.

Vegetable Wax: the product of various plants, used as a substitute for beeswax. (1) Myrtle wax, produced from the bayberry or wax-myrtle, *Myrica cerifera* of the U. S. It is of a greenish hue, and is used in pharmacy as a vehicle. Candles made of it emit a pleasant odor, but do not give a good light. (2) The wax of the Carnahuba palm, *Copernicia cerifera* of Brazil. It is used in Europe in candle-making and for waxing floors and furniture. (3) The abundant and rather resinous product of *Ceroxylon andicola*, a fine palm-tree of the Andes, is used for candles when mixed with tallow. (4) The Japan wax, produced by boiling the seeds of *Rhus succedanea*, a sumach-tree. It closely resembles beeswax, and is used in candle-making. It should not be confounded with China wax, which is an insect product.

Vegeta'rianism [deriv. of *vegetarian*; *vegetable* + *-arian*, a suffix denoting one addicted to or believing in anything]: a view according to which vegetable substances ought to form the sole food of man, while the use of all animal substances, or at least of meat proper, ought to be avoided in the diet as something wrong, both physiologically and morally. Many of the ancient philosophers—as, for instance, Plato—encouraged a vegetable diet as the most suitable for the well-being of man, physically and morally; and some of them—as, for instance, Pythagoras—absolutely forbade the use of animal food. In modern times the view found eloquent advocates in Rousseau, Shelley, and others, and in 1847 a society for the propagation of vegetarianism was formed at Manchester, England. A similar society was formed in the U. S. in 1850. Since then the movement has attained considerable proportions.

Vege'tius, Flavius Renatus: author; b. probably in Rome in the latter part of the fourth century A. D.; wrote an *Epitome* (*Institutionum*) *Rei Militaris*, dedicated to an emperor whose name is not given, possibly Theodosius II. (408–450). The work is in four books, and is chiefly a compilation from previous writers. The first book treats of the levying and training of soldiers; the second of the early discipline and of the formation of the Roman army; the third of strategy; the fourth of the art of defending and of assaulting fortified places and of naval warfare. From some expressions of Vegetius it is believed that he was a Christian. Best editions by Schwebel, with the notes of Oudendorp and Bessel (Strassburg, 1806), and with revised text by C. Lang (Leipzig, 1885). A veterinary treatise under the title *Mulo medicina* is probably by the same Vegetius. It is printed in Schneider's *Scriptores rei rusticæ* (Leipzig, 1794–97). Revised by M. Warren.

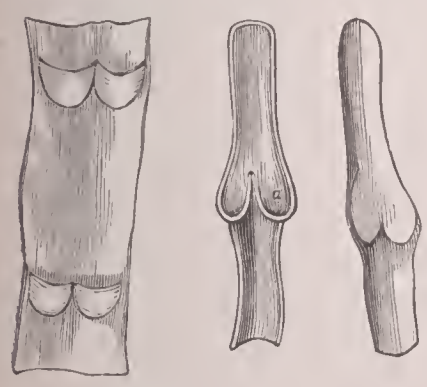
Veglia, vāl'yăă: an island of Austria, belonging to the government of Triest, in the Gulf of Quarnero, an inlet of the Adriatic. It is 23 miles long, 12 miles broad, mountainous, and produces timber, wine, silk, marble, and salt. Pop. about 18,000, including four towns of between 1,600 and 2,200 inhabitants.

Vehicle: See Excipient.

Vehmic Court, or **Vehmgericht**: See Fehmic Court.

Vehse, vā'ze, Karl Eduard: historian; b. at Freiberg, Saxony, Dec. 18, 1802; studied jurisprudence in Leipzig and Göttingen; was appointed assistant keeper of the royal archives in Dresden in 1825; published his *Geschichte Kaiser Ottos des Grossen* in 1828, and became chief of the archives in 1833. In 1838 he resigned his office and went to America, but returned in 1839; settled in 1843 in Berlin, but was arraigned for some passages in his *Geschichte der deutschen Höfe* (48 vols., 1851–58), condemned to six months' imprisonment, and banished from Prussia. Settled in 1856 in Switzerland; lived in Italy 1857–62. D. near Dresden, Saxony, June 18, 1870. He also wrote *Shakspeare als Protestant, Politiker, Psycholog und Dichter* (2 vols., 1851).

Veins [from O. Fr. *veine* < Lat. *vē'na*, artery, vein, for * *vex'na*, deriv. of *ve'here*, *vec'tum*, carry: Eng. *wagon*, *way*]: the companion vessels to the arteries, distributed throughout the body for the purpose of returning the venous or impure blue blood from the extremities, surfaces, and viscera to the right auricle of the heart, and the purified blood from the lungs to the left auricle. They are membranous canals, essentially devoid of elasticity and without pulsation. They arise from venous capillaries which collect from the tissues the blood recently brought to them by the arterial capillaries, richly freighted with oxygen and nutritive matter. These venous capillaries unite to form ultimate veins, which still again unite, and form successively larger branches and trunks as they approach the center of the circulation. The motion of venous blood is secured in part by the *vis a tergo*, or power of the capillary chemico-vital nutritive processes, in part by the pressure of the moving muscles and viscera between which the veins are imbedded, the veins being provided with valves which permit of blood-currents toward the heart, but not the reverse. Veins have three coats—internal, middle, and external. The veins are not uniform, symmetrical cylinders, like the arteries, but have pouches or sinuses adjacent to the valves, so that a vein distended resembles a bamboo stick with bulbous or knotted joints. The veins, like the arteries, have nutrient vessels, or *vasa vasorum*, in their walls. The veins of bones are termed sinuses, their outer coat being replaced by the endosteum or fibrous lining of the bone, as in the great sinuses of the skull. The venous blood returned by the veins from above the region of the heart is united in one great vein, the *vena cava superior*, all from below entering by the *vena cava inferior*. The *vena azygos* collects the blood from the chest-walls and other structures which does not flow into either of the *venæ cavæ*. The portal vein receives the venous blood from the intestines, and conveys it to the liver. The pulmonary vein and branches go from the lungs to the left auricle of the heart, carrying the blood that has been revivified by the oxygen of inspired air. See Circulation of the Blood. Revised by William Pepper.


Valves of veins.

Veintemilla, vā-ĕen-tā-meel'yăă, Ignacio: general and politician; b. at Cuenca, Ecuador, in 1830. He was the leader of the extreme liberals who revolted against Borrero 1876–77. Borrero was deposed after a civil war, and in 1878 Veintemilla was made president with extraordinary powers by a convention that met at Ambato; at the same time a new constitution was adopted. Some reforms were instituted, the revenues were increased, and an attempt was made to secularize education. Disorders continued; the president assumed dictatorial powers Mar. 2, 1882, but conservatives and liberals united against him, and he was deposed in July, 1883, fleeing from the country. H. H. S.

Veit, fīt, Philipp: painter; b. in Berlin, Prussia, Feb. 13, 1793; was educated by Friedrich Schlegel, who became his stepfather, and exercised a decisive influence on the peculiar cast of his mind; made his first art-studies in Dresden; joined afterward Cornelius and Overbeck in Rome, and became one of the most vehement champions of the Catholic romantic school in painting. In 1830 he was appointed director of the Städel institute of art in Frankfort-on-the-Main, but resigned this place in 1843 because the institute bought Lessing's picture of *Huss before the Council of Constance*, and removed his studio to Sachsenhausen, opposite Frankfort. He painted in both fresco and oil. Among his most remarkable pictures are the *Seven Years of Plenty*, in the Villa Bartholdy in Rome; *Christianity bringing the Fine Arts into Germany*, in the Städel institute of Frankfort; the *Assumption of the Virgin*, in the Cathedral of Frankfort; and the *Egyptian Darkness*, for the King of Prussia. D. at Mentz, Germany, Dec. 18, 1877. Revised by Russell Sturgis.

Veitch, veech, John: philosopher; b. at Peebles, Scotland, Oct. 24, 1829; educated in the grammar school of that place and in the University of Edinburgh; was assistant in logic and metaphysics in that university 1855–60; became Professor of Logic, Metaphysics, and Rhetoric in the University of St. Andrews 1860, and Professor of Logic and Rhetoric in the University of Glasgow 1864. He translated Descartes's *Discourse on Method* (Edinburgh, 1850), and the same author's *Meditations and Selections from the Principles of Philosophy* (1853); prepared a *Memoir of Dugald Stewart* for the revised edition of the *Complete Works* of that philosopher (vol x., 1858); was joint editor with Dean Henry L. Mansell of Sir William Hamilton's *Lectures on Metaphysics and Logic* (Edinburgh and Boston, 4 vols., 1859–60), and wrote a *Memoir of Sir William Hamilton* (Edinburgh, 1869); *History and Poetry of the Scottish Border* (1877; new ed. 1892); and *Merlin and other Poems* (1889). D. Sept. 3, 1894. Revised by J. M. Baldwin.

Vela, Blasco Nuñez: See Nuñez Vela.

Vela, Vincenzo: sculptor; b. at Ligurnetto, canton of Ticino, Switzerland, in 1822; was trained as a stone-cutter in the quarries of Viggio; went to Milan in 1836, where he studied drawing; worked in the studio of Cacciatori, and made models for jewelers; removed in 1847 to Rome; won a prize in 1848 at Venice by his bas-relief, *Christ raising the Daughter of Jairus*; volunteered in the Italian war against Austria in 1848; settled permanently in Turin, and attracted general attention by his statues *A Prayer* and *Spartacus*. Among his later works are *Harmony in Tears* (1855), for the monument of Donizetti, at Bergamo; *France and Italy*, a group (1863), presented by the ladies of Milan

to the Empress Eugénie; *Columbus and America* and *The Last Days of Napoleon*, in the Corcoran Gallery, Washington, D. C. The two last-named works and *Spring* at the Paris Exhibition of 1867 won for their author the rank of officer of the Legion of Honor. D. at Bellinzona, Ticino, Oct. 3, 1891. Revised by RUSSELL STURGIS.

Velars [Lat. *velum*, veil, the soft palate]: a technical term of phonetics, applied to denote the series of back-guttural sounds, ɟ, ɟh. *g*, *gh*, etc., produced between the back of the tongue and the soft palate, as *c* in *cat*, *g* in *got*, etc., and distinguished from the palatals or front gutturals, such as *k* in *kin*, *g* in *gear*, etc. B. I. W.

Velas'co: town (laid out in 1891); Brazoria co., Tex.; on the Brazos river, 5 miles from its mouth, and on the Velasco Terminal Railway; 20 miles S. of Columbia (for location, see map of Texas, ref. 6–J). It is the outgrowth of a successful attempt to secure a deep-water shipping-point on that part of the Texas coast by jetty-work at the mouth of the river. A private corporation expended over $1,500,000 on this work, and vessels of the deepest draught now load and unload at the wharves of the town. Velasco has thus become an important point for the shipment of cotton, cottonseed oil, cake, and meal, coal, and other productions of Texas. The town has 5 churches, several public and private schools, a national bank with capital of $50,000, 2 weekly newspapers, ice-factory and refrigerator plant, planing-mill, brick-yards, electric-light and power plant, and large coal elevator. Pop. (not returned separately in 1900) estimated, 1,500. EDITOR OF "WORLD."

Velázquez, vā-lăăth'kāth, DIEGO, de: conqueror of Cuba; b. at Cuéllar, Segovia, Spain, in 1465 (according to others, in 1458). He served in the conquest of Granada, and in 1493 went to Española with Columbus. There he was prominent in the wars against the Indians, received large *encomiendas*, and became wealthy. In 1511 he was commissioned by Diego Columbus to conquer Cuba. Leaving Española at the end of the year with 300 soldiers, he landed near the eastern extremity of Cuba and speedily defeated the cacique Hatuey, who was cruelly put to death. Thereafter Velázquez intrusted much of the active campaign work to his lieutenant, Panfilo de Narvaez. The unarmed natives were easily conquered, and, as usual, reduced to the slavery of the *encomiendas*, in which most of them soon perished. Velázquez founded Trinidad, Matanzas, and other places, and made his first capital Santiago. Though nominally a deputy of Diego Columbus, he practically assumed independent command. In 1517 he was a partner in the slave-seeking expedition of Cordova, which resulted in the discovery of Yucatan. Elated with the hope of new conquests, he fitted out Grijalva's expedition in 1518; and on receiving certain information of the rich Aztec empire, he prepared a strong fleet for its conquest, giving the command to CORTÉS (*q. v.*). The latter, on his arrival at Vera Cruz, assumed independent command, and Velázquez sent Panfilo de Narvaez (1520) with orders to bring Cortés back a prisoner. Narvaez was defeated by Cortés, and all efforts of Velázquez to secure the Mexican conquests for himself failed. Vexation for his loss was the reputed cause of his death in Havana, 1522 or 1523. HERBERT H. SMITH.

Velázquez, DIEGO RODRÍGUEZ DE SILVA: painter; b. of Portuguese parents, at Seville, Spain, June 5, 1599. Herrera el Viejo was his first master in art. He left the latter for the studio of Francisco Pacheco, who recognized the great genius of Velázquez, and whose daughter he married (1618). Velázquez visited Madrid in 1622, but after some months returned to Seville. The next year he was called there to be introduced to King Philip IV., who appointed him court painter and showed him marks of the greatest favor. It was at this time (1623) that Velázquez painted a portrait-sketch of Charles I. as Prince of Wales. Velázquez first went to Italy in 1629, and spent a year in Rome and also some time in Naples, where he met the Spanish painter Ribera, whose work influenced his own considerably. He was again in Italy in 1648, sent by the king to purchase works of art. During this visit Velázquez painted the famous portrait of Pope Innocent X., now in the Doria Gallery, at Rome. The office of *aposentador mayor* was conferred upon him on his return, as well as the Cross of St. Iago. The duty attached to this office was the providing for the king's lodgment during his absence from the capital, and his death is attributed to his exertions in providing the royal quarters at the conference in Turin. Velázquez died Aug. 6, 1660, on his return to Madrid, and was buried with great pomp in the Church of St. Juan. His wife died of grief a week after him. He was an unrivaled portrait-painter; unlike his brother artists, he rarely touched religious subjects, and his mythological compositions were treated in a realistic spirit, the figures being dressed in the costume of his time. The technique of Velázquez is so marvelous that Mengs said of him: "Velázquez seems to have painted with his will only, without the aid of his hand." His work can be best judged of in Madrid, although splendid examples have found their way to the Louvre, the London National Gallery, the Capitol and Palazzo Doria in Rome, and many European collections. For details of his life and works, see Curtis, *Velazquez and Murillo* (London, 1883); Stirling Maxwell, *Velazquez and his Works*; L. Viardot, *Notices sur les principaux peintres de l'Espagne*; C. Blanc, *Velazquez à Madrid*; *Gazette des Beaux-Arts*, vol. xv., p. 65; R. Lefort, *Velazquez*, in *Gazette des Beaux-Arts*, second period, vols. xix., xx., xxi., and following (years 1879–82). W. J. STILLMAN.

Velde, vel'de, ADRIAN, van de: painter; b. in Amsterdam, Holland, in 1635. He studied first under his father, then with Wynants and Wouverman. He became one of Holland's most accomplished "little masters." He painted landscapes with cattle, frost and snow scenes, human figures, with equal skill, realism, and poetry. Ruisdael, van der Heyde, and Hobbema often employed him to paint figures in their landscapes. D. in Amsterdam, Jan. 21, 1672. He is well represented in the National Gallery, London, in the Dresden Gallery, in the Louvre, and in the Six Collection and the museum in Amsterdam. Van de Velde was also a most skilled engraver; twenty-nine of his plates are well known. W. J. S.

Velde, WILLEM, van de: See VANDERWELDE.

Veldeke, vel'de-ke, HEINRICH, von: poet; b. at Veldeke, near Maestricht, Netherlands; lived in the latter half of the twelfth century, and was present at the great gathering of princes and knights under Frederic I. at Mentz in 1184. He was familiar with Latin and French, wrote *Servatius*, the story of a saint, following a Latin original, and translated the French *Roman d'Énéas* of Benoît de Sainte-More in his famous *Eneide*. The last-named work was finished previous to 1190. Veldeke is praised by Gottfried von Strassburg as the first who introduced the court epic in Germany, and Rudolf von Ems lauds him as a reformer of the metrical form who first among German poets used perfect rhymes. These opinions exactly describe Veldeke's position in the history of German literature. While he was mediocre as a poet he had the good fortune to appeal to the tastes and demands of his contemporaries, who saw in him the beginning of a new literary era. As a writer of minnesongs Veldeke was less influential, though he was here also among the first to introduce French models. See Behaghel, *Heinr. v. Veldekes Eneide* (1882); R. von Muth, *H. v. Veldeke* (Vienna, 1870); Scherer, *Deutsche Studien*. J. GOEBEL.

Veley, VICTOR HERBERT, M. A., F. R. S.: chemist; b. at Chelmsford, England, Feb. 10, 1856; educated at Rugby and at University College, Oxford; public examiner in the Honour School of Natural Science 1887–90; became demonstrator and lecturer at the University Museum, Oxford, 1887; lecturer of Queen's College 1891; and tutor to the delegacy of the non-collegiate students 1890. Author of numerous papers on theoretical, physical, and applied chemistry, contributed to the *Proceedings* of the Royal Society and to various periodicals.

Vélez, vā'lāth: town of Santander, Colombia; in the southern part of the department, on a mountain-side, 7,185 feet above the sea (see map of South America, ref. 2–B). It is surrounded by precipices and can be reached only over dizzy mountain roads. It was founded in 1539, its singular situation being then an advantage for defensive and strategic purposes. During the colonial period it was important, and it is still one of the first towns of the department. The vicinity is noted for many natural curiosities and magnificent scenery. Pop. about 11,000. H. H. S.

Vélez Málaga: town; province of Malaga, Spain; on the river Velez, near its mouth in the Mediterranean (see map of Spain, ref. 19–E), in a plain of the highest fertility, producing sugar, cotton, and rice, besides wine and fruits. The town itself is old and somewhat decadent, but it is rich and carries on an important trade. It contains the ruins of a Moorish castle and two fine old churches. Pop. (1887) 23,425.

Velia, or **Elea**: an ancient Greek city. See ELEA.

Veliger [Mod. Lat., veil-bearing; Lat. *velum*, veil + *gerere*, to bear]: an embryonic stage in the development of many molluscs, succeeding the trochophore stage.

Velius Longus: a Latin grammarian of the time of Trajan, author of a commentary on Vergil's *Æneid*, and a treatise *De Orthographia*, which is still preserved. See Keil, *Grammatici Latini*, vol. vii.

Velleius Paterculus: See PATERCULUS, GAIUS VELLEIUS.

Velle'tri (anc. *Ve'litræ*): town; province of Rome, Italy; on a spur of Monte Artemisio, about 26 miles S. E. of Rome (see map of Italy, ref. 6–D). Velletri was one of the most conspicuous of the Volscian cities and one of the most restless and rebellious under the Roman yoke. The Octavian family is said to have transferred itself from Velletri to Rome during the reign of Tarquinius Priscus, and to have been immediately admitted, as one of the chief heads of the Volsci, to the full rights of Roman citizenship. The modern town, though near the Pontine Marshes, is healthful. The cathedral and other churches contain ancient marbles, pictures, and other mediæval objects worthy of notice. The town is supplied with water by a subterranean aqueduct about 8 miles in length, constructed by Fontana. Pop. about 13,500. Revised by M. W. HARRINGTON.

Vellore': town; in the Arcot district of Southern India; on the banks of the Pālār; 80 miles by rail W. of Madras (see map of S. India, ref. 6–E). It has a strong fort surrounded by a deep moat excavated out of the solid rock. The European quarters of the town are spacious and pleasant. Vellore contains a fine temple to Vishnu, and has considerable trade. Tippu Sahib used to live a great part of each year at this salubrious station. In 1780–82 the fortress was held by the British against Hyder Ali. Pop. (1891), including cantonment, 44,925.

Vellum: See PARCHMENTS.

Velocim'eter [Lat. *ve'lox*, *velo'cis*, swift + Gr. μέτρον, measure]: an instrument for measuring with extreme accuracy the velocity of projectiles by means of electricity. It was invented by Wheatstone in 1840, and received ingenious improvements from Col. J. G. Benton of the U. S. ordnance department. A simpler form, called a chronograph, has been devised by Capt. Le Boulengé of Belgium, and is extensively used in the U. S. and in Europe. Several others of greater complexity have also been invented and used. See CHRONOGRAPH and CHRONOSCOPE.

JAMES MERCUR.

Velocipede [Lat. *ve'lox*, *velo'cis* + *pes*, *pe'dis*, foot]: originally a vehicle invented in 1816 by Baron Drais de Sauerbrunn, of Mannheim, consisting of a seat resting upon two wheels, one before the other. The rider sat astride the seat, and propelled the vehicle by striking the ground with his toes. Later velocipedes were propelled by the action of the feet upon a crank attached to the axle of the forward wheel. Velocipedes are now called unicycles, bicycles, tricycles, or quadricycles, according to the number of wheels. (See CYCLING.) Few things are more puzzling to an ordinary observer than the self-balancing or self-sustenance of the bicycle. If he makes the experiment, he finds his forebodings, founded upon the absence of base for stable equilibrium in the two wheels in the same fore-and-aft plane, but too well verified. The principle by which the skilled rider sustains himself is perhaps best illustrated by reference to the familiar experiment of balancing a long pole in a vertical position on the chin or end of the finger. The equilibrium of a pole thus balanced (supposing it to be perfectly so, which it never is) is unstable; but in its almost vertical (or balanced) position the motion of fall is extremely slow; the holder is easily able to detect it, and to move his finger (or chin) so as to counteract it. The process for the bicycle is not identical, but analogous; the experienced rider feels such incipient tendency of the vehicle to fall either way, and by an acquired habit, which becomes instinctive, checks it through the guiding-wheel, slightly varying his direction. The centrifugal force due to the deflection of his moving velocity thus brought into action counteracts each incipient falling tendency. Perhaps it would be more proper to say that what is, in statics (without motion), a position of unstable equilibrium is made kinetically (i. e. through motion) stable. Revised by R. H. THURSTON.

Velocity: See MOTION, ACOUSTICS, FALLING BODIES, GUNNERY, LIGHT, etc.

Velvet: See TEXTILE FABRICS.

Venable, CHARLES SCOTT, LL. D.: educator; b. in Prince Edward co., Va., Apr. 19, 1827; educated at Hampden-Sidney College, the University of Virginia, and Berlin and Bonn, Germany. He became Professor of Mathematics at Hampden-Sidney College in 1847, of Physics and Chemistry, University of Georgia, 1859, and of Mathematics and Astronomy, University of South Carolina, 1860. At the outbreak of the civil war he became captain of engineers and served at New Orleans and Vicksburg; in June, 1862, was appointed to the staff of Gen. R. E. Lee (major A. D. C.); and in 1864 was promoted lieutenant-colonel and assistant adjutant-general. Since Oct., 1865, he has been Professor of Mathematics in the University of Virginia. He is the author of a series of mathematical text-books.

Venable, WILLIAM HENRY: See the Appendix.

Vena Contracta: the contraction of a stream of water issuing from an orifice in a thin plate. Newton first made measurements of the contracted vein. Its area is about 62 per cent. of the area of the orifice. See HYDRAULICS.

Venantius: See FORTUNATUS, VENANTIUS HONORIUS CLEMENTIANUS.

Vena'tion [from Lat. *vena*, a vein]: in botany, the manner in which the fibrovascular bundles (veins) are arranged in leaves. The veins are more properly parts of a framework, and not of a circulatory system, as the name might imply. In the growth of the young leaf of the higher plants one or more columns of meristem cells develop into fibrovascular tissues, the so-called veins. These are connected below with the fibrovascular system of the stem. As the leaf enlarges, its veins develop accordingly. Where the leaf-growth is mainly longitudinal, as in the grasses and sedges, the veins are necessarily longitudinal and more or less parallel; but where the growth is in all directions, the veins have a net-like arrangement, as in pumpkin-leaves and grape-leaves. Descriptive botanists distinguish two principal kinds of venation, viz., parallel and reticulated or netted, each having a number of varieties. Thus in parallel venation we distinguish the longitudinal (from base to apex, Fig. 1, A), transverse (from midrib to margin, Fig. 1, B),

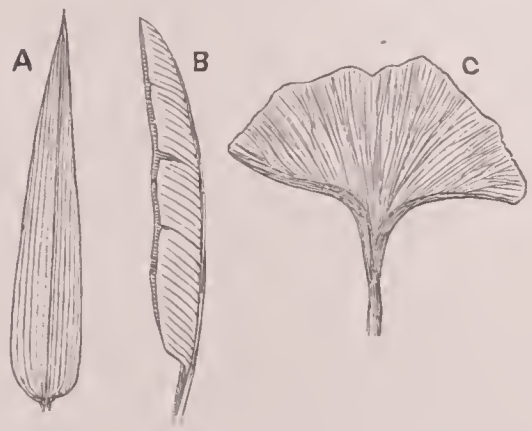


FIG. 1.—Parallel venation: A, longitudinal; B, transverse; C, flabellate.

flabellate (radiating from the summit of the petiole, Fig. 1, C). In the reticulated venation we may distinguish the pinnate (from midrib to margin, Fig. 3, A), radiate or palmate (from the base to the margin, Fig. 3, B). The veins of many ferns are forked, dividing once or more and running free to the margin without uniting again (Fig. 2, A), or uniting and forming the reticulated venation (Fig. 2, B).

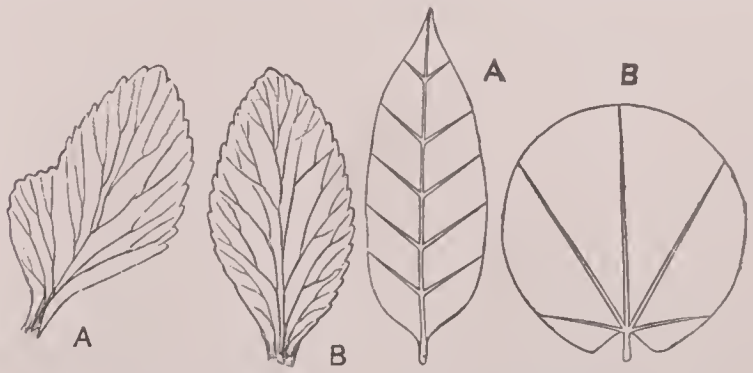


FIG. 2.—Reticulated venation: A, pinnate; B, radiate.

FIG. 3.—Forked venation: A, free; B, reticulated.

CHARLES E. BESSEY.

Vendace: the *Coregonus vandesius*, a trout-like fish of the family *Coregonidæ*, found in the lakes of Scotland and

The vendace.

Sweden. Its introduction into Scotland is ascribed to Mary Queen of Scots. It is a fine table-fish, and is caught in nets, since it never takes the hook. Revised by F. A. Lucas.

Vendée, La, lăa-vaăn'dā' : department of France; bordering W. on the Bay of Biscay. Area, 2,588 sq. miles. The coast is either sandy or occupied by salt-marshes, from which it has received the name of *Marais*. The northern part, the *Bocage*, is more elevated, but the ground is covered either with heath or with pine forest. The rest of the department, the *Plaine*, is fertile land, eminently well suited to agriculture. In spite of all disadvantages, both the Marais and the Bocage are well peopled and carefully cultivated; flax, hemp, and vegetables are produced in the former, honey, fruit, and hops in the latter, and wine in both districts. In the Plaine much wine, wheat, and fruit are produced, and many cattle are fattened for the Paris market. Iron and coal are found. La Vendée is noted for the vigorous resistance offered by its inhabitants to the Revolution. Devoted to the Church and the Bourbon monarchy, the peasantry broke out in revolt on Mar. 10, 1793, and headed by Cathelineau and La Rochejaquelein (*qq. v.*) defeated the forces of the Government at every point, till Kléber and Marceau took the field against them with a large army. At Le Mans they were defeated with great loss, and after Dec., 1793, ceased to be formidable. A second revolt broke out in 1795, but was put down by Hoche. During the Hundred Days they supported the restored Bourbon monarchy, but were held in check by Napoleon's general Lamarque. Pop. (1896) 441,735. Capital, La Roche sur Yon. See Beauchamp, *Histoire de la Guerre de la Vendée et des Chouans* (1807), and Bonnemère, *Les Guerres de la Vendée* (1884). Revised by M. W. Harrington.

Vendémiaire [Fr., from Lat. *vinde'mia*, vintage; *vinum* + *de'mere*, remove]: in the French revolutionary calendar the period from Sept. 23 to Oct. 21. It was the first month in the revolutionary year.

Vendet'ta [Ital.]: a feud or condition of private war in which the nearest kinsman assumes the duty of avenging an injury to a member of the family. The term originated in Corsica, where it has played a most important part in social life. When a murder has been committed, the murderer is pursued not only by the officers of justice whose duty it is to punish offenses against society, but also by the relatives of the slain, upon whom the received views of social duty impose the obligation of personally revenging his death. In such a case the relatives of the murdered man take up arms and hasten to pursue the murderer. If he succeed in eluding their pursuit, the murder may be revenged upon his relatives; and, as the vengeance may be taken whenever an opportunity occurs, the relatives of a murderer whose crime is unavenged have to live in a state of incessant precaution. Similar customs have marked a certain stage in the history of every civilized nation in its progress toward the establishment of the administration of justice on its modern basis, and are still to be found among the less advanced peoples, such as the Montenegrins, Albanians, Druses, Bedouins, etc. F. M. Colby.

Vendôme, vaăn'dōm' [Lat. *Vindocinum*, originally a Gallic *oppidum*]: capital of an arrondissement in the French department of Loir-et-Cher; on the Loir, 20 miles N. W. of Blois, and on the Orleans Railway and the State Railway (see map of France, ref. 4–E). It has a lyceum and a library of 15,000 volumes, and is an industrial center, its manufactures including leather, gloves, cotton goods, and paper. Pop. (1891) 9,538. Parts of the castle of the Dukes of Vendôme date from the eleventh century. Several battles were fought in the vicinity in 1870 between the army of the Loire and the Tenth Prussian Corps.

Vendôme: an ancient countship of France, founded about the end of the tenth century, corresponding nearly to the present department of Loir-et-Cher; raised to a peerage duchy in 1515 by Francis I. and given to Charles of Bourbon. It reverted to the crown on the accession of Henry IV., the grandson of Charles, in 1589, but in 1598 he bestowed it on his eldest son by Gabrielle d'Estrées, César (b. in 1594; d. in 1665), from whom descended the house of Vendôme. During the minority of his half-brother Louis XIII., César played a conspicuous part in the intrigues and conspiracies against Richelieu, later against Mazarin and in the entanglements of the Fronde, but having become reconciled to the court, he defeated, as great-admiral of France, the Spanish fleet off Barcelona in 1655. César left two sons, Louis, Duc de Vendôme (b. in 1612; d. Aug. 6, 1669), and François de Vendôme, Duc de Beaufort (see Beaufort), nicknamed *Roi des Halles* on account of his sympathy with the people during the disturbances of the Fronde. Louis, Duc de Vendôme, had the title of Duc de Mercœur during his father's lifetime. He served with distinction in the wars of Louis XIII., and was made viceroy of conquered Catalonia in 1649 by Mazarin. He married Laura Mancini, one of Cardinal Mazarin's nieces, but became a priest after her death in 1656, and was made a cardinal in 1667. He left two sons, Louis Joseph, called till his father's death the Duc de Penthièvre (b. in Paris, July 1, 1654; d. at Tiñaroz, in Valencia, June 11, 1712), and Philippe de Vendôme, great prior of the Knight Templars in France (b. Aug. 23, 1655; d. Jan. 24, 1727), with whom the family became extinct.

Louis Joseph began his military career in 1672 under Turenne, in the Netherlands, Germany, and Alsace, and under Créqui in Flanders before the peace of Nymwegen (1688). He won great renown in the war of the Palatinate (concluded by the Peace of Ryswick in 1697), serving under Luxembourg in the Netherlands, participating in the sieges of Mons and Namur, and in the battles of Leuze and Steenkerk, then serving under Catinat in Italy, where he commanded the left wing in the battle of Marsaglia (Oct. 4, 1693). Owing to the duke's careless and sensual nature, Louis XIV. hesitated long before intrusting him with an independent command. In 1696, however, he was given command of the army in Spain, began the siege of Barcelona, defeated an approaching Spanish army, and forced the fortress to surrender Aug. 10, 1697, which glorious event enabled Louis XIV. to negotiate the favorable Peace of Ryswick (1697). He was sent to Italy in 1702, during the Spanish war of succession, to supersede Villeroi, who had been captured at Cremona; he reorganized the demoralized army, fought Prince Eugene of Savoy at Luzzara (Aug. 15, 1702) without being defeated; tried to pass through the Tyrol into Germany in the spring of 1703, but was prevented by the bravery of the Tyrolians and the revolt of the Duke of Savoy in his rear. At Trent he turned round, defeated the Piedmontese completely, took several fortresses, and began the siege of Turin. In the spring of 1706 he defeated the Austrians under Reventlow at Calcinato, and drove them beyond the Adige, taking advantage of Eugene's absence in Vienna. From this brilliant campaign he was called to the Netherlands to make amends for Villeroi's defeat at Ramillies, but he was himself completely defeated by Marlborough and Eugene at Oudenarde (July 11, 1708), and lost his command owing to the intrigues of Mme. de Maintenon, who bitterly hated him. In 1710 the situation of the French party in Spain became so desperate that Philip V. thought he could be saved only by Vendôme, who was accordingly sent to Spain by Louis XIV. He created an army, defeated the English at Brihuega, the Austrians under Stahremberg at Villaviciosa (Dec. 10, 1710), carried the king back to Madrid, and finished the war. Shortly afterward he died, and the duchy of Vendôme reverted to the crown of France. Philip V. had his body interred in the Escorial. Hermann Schoenfeld.

Vendor's Lien: (1) the lien of the vendor on lands for purchase-money which is unpaid and unsecured save by the purchaser's verbal or written promise. It is available against any one but a purchaser for value without notice. (See Lien, *Equitable Liens*.) (2) The term is also applied to the lien of the seller of personal property. This, however, is a common-law or possessing lien, and entitles the seller to retain possession of the property until payment or tender

of the price, where the sale is for cash, or where it was on credit but the term of credit has expired, or when the buyer has become insolvent. While possession of the goods by the seller is essential to this lien, it does not matter that he has possession as agent, bailee, or custodian of the buyer. It is available against any part of the goods remaining in the seller's possession, unless the portion delivered was intended to represent the whole, in which case the lien will have been waived. See STOPPAGE IN TRANSITU.

FRANCIS M. BURDICK.

Venedey, vā'ne-dī, JAKOB: author; b. at Cologne, May 24, 1805; studied law in Bonn and Heidelberg, and began to practice as an advocate in his native city, but fled to France in 1832 on account of an injunction against his *Ueber Geschwornengerichte* and other conflicts with the Prussian police; settled in Paris, and began in 1835 to issue a monthly paper, *Der Geächtete*; was twice banished from Paris, but finally allowed to live there by the intervention of Arago, Mignet, and others whose interest he had gained by his work, *Römerthum, Christenthum, Germanenthum* (1840); returned to Germany in 1848, and sat in the national assembly in Frankfort, where he voted with the radicals; was banished from Berlin and Breslau; went to Zurich, but settled finally in Oberweiler, Baden. After a visit to England (1843–44), he wrote *Irland* (2 vols., 1844) and *England* (3 vols., 1845); he also wrote *Geschichte des deutschen Volks* (4 vols., 1854–62). D. at Oberweiler, Feb. 8, 1871.

Veneering [from Germ. *furnieren*, veneer, from Fr. *fournir*, furnish]: in cabinet-work, the art of laying thin leaves (usually) of some valuable wood or other material upon a foundation of inferior material. It was known to the Romans, and is referred to by Pliny as a novelty. The plates were formerly sawn by hand, but in 1806 Brunel introduced a method of splitting them from straight-grained wood, and employed circular saws for carved and knotted wood. Veneers of ivory and bone are now largely used for some purposes. The finer processes are called MARQUETRY and BUHL-WORK (*qq. v.*)

Venegas, vā-nā'găăs, FRANCISCO JAVIER, de: general and administrator; b. at Ecija, Spain, about 1760. He attained the rank of lieutenant-general in the wars with France, and was Viceroy of Mexico Aug., 1810 to Mar., 1813. This period embraced the first revolutionary struggles. (See HIDALGO Y COSTILLA and MORELOS Y PAVON.) The viceroy did not take the field personally, but he was responsible for many of the cruelties which characterized the war; he was constantly hampered by the intrigues of his principal general, Calleja, who finally supplanted him. On his return to Spain he acknowledged the rule of Joseph Bonaparte and was created Marquis of La Reunion in honor of his supposed pacification of Mexico. D. about 1820.

HERBERT H. SMITH.

Venereal Ulcer, or **Chancroid** [Fr. *chancre*: Ital. *cancro* < Lat. *cancer*, crab, ulcer; cf. Eng. doublet *canker*]: a certain acute, contagious ulceration that results from venereal contact. It is a purely local disease, possessing symptoms that entitle it to be considered the highest type of acute ulcerative action. In the majority of cases it is the result of inoculation of the purulent secretion of an already existing ulcer of a similar character. It is commonly established upon an abrasion of the skin or mucous membrane produced *in coitu*. On application of the purulent secretion of the venereal ulcer to an abrasion, either on the person already affected or on one previously free from the disease, congestion, inflammation, suppuration, and rapid destruction of tissue follow in quick succession. Chiefly characterized by its contagious property, the venereal ulcer is seldom single, several distinct lesions usually presenting at the same time. Occurring under circumstances of good general health, cleanliness, and temperate living, its progress is usually self-limited. It gradually increases from two to five weeks, and the loss of tissue is then slowly restored. When acquired under unfavorable conditions, such as a depraved constitution, irregular life, filth, and alcoholic excess, the chancroid assumes its most vicious type.

The venereal ulcer or chancroid, in its early stages, is promptly amenable to judicious remedial measures. The application of any caustic, of sufficient power to destroy completely all the tissue which has been implicated in the diseased action, suffices to change the contagious venereal ulcer to a simple sore, when it goes on to recovery without other treatment than such simple sores require. It is also found that the particular lesion which may be present partakes in great degree of the activity which characterized the lesion from which it was derived, so that every grade from the simple excoriation to the sharply defined and most active ulcer may be met. In the milder varieties the judicious application of antiseptic, sedative, and astringent agents may suffice to bring about an arrest and cure.

In regard to its history, the venereal ulcer or chancroid is conceded to be of ancient origin, even to antedate the advent of syphilis. It has various synonyms—viz., pseudo-syphilis, soft chancre, non-infecting chancre, chancroid, etc. It is known almost universally at the present day by the last term. It was distinctly recognized and described by the ancients as a disease known from the earliest times. Notwithstanding this, shortly after the recognized appearance of syphilis in Europe in 1494, it became confounded with that disease. Its purely local character was lost sight of, and it was subjected to constitutional treatment as a form of syphilis. Its chief characteristics, however, always most marked, were never quite lost sight of. Evincing its destructive property at once on inoculation of its secretion upon healthy tissue, and commonly associated with inflammatory enlargement and suppuration of contiguous lymphatic glands, it was thus directly opposed to the sluggish course of the syphilitic local affection and its non-suppurating glandular concomitants. Yet it was so often found associated with and followed by the constitutional manifestations of syphilis that its distinctive significance was doubted; and when, after a time, the well-known acute venereal ulcer was occasionally observed to exchange its soft edge and base for the indurated tissue known to characterize the early syphilitic lesion, the fallacious theory of *post hoc ergo propter hoc* prevailed, and thus the confusion of the two distinct diseases became complete. From this time all the contagious venereal diseases, gonorrhœa, chancroid, and syphilis, were accepted as practically identical, requiring the same constitutional treatment. John Hunter in 1786 was the first to recognize publicly the value of the induration characteristic of the venereal sore which was followed by constitutional syphilis, thus making the first positive step toward identifying and restoring to the different venereal disorders their distinctive individuality. In 1798 Benjamin Bell, of London, claimed a simple origin of gonorrhœa, and in 1830 Ricord, of Paris, after a series of observations and elaborate experiments in inoculating the purulent fluid of gonorrhœas and of the soft and hard venereal lesions, demonstrated the purely simple, non-specific nature of gonorrhœa, thus completely and forever eliminating it from among the manifestations of syphilis. Finally Bassereau, of Paris (a pupil of Ricord), in 1852 demonstrated the fact that in the disease then known as syphilis, comprising the soft local venereal ulcer and the indurated infecting venereal sore with its consequences, two separate diseases existed. Observations have shown that the muco-purulent secretion from non-specific nasal catarrh will sometimes produce excoriations of sound cuticle, and that contact with secretions from non-specific leucorrhœas will sometimes promptly cause pustular eruptions (*herpes*) of the preputial mucous membrane of the male; and these more or less rapid in development and progress according to the degree of activity of the inoculating secretion—in some instances so simple that they are scarcely more than sero-purulent vesicles, and in other cases observed so vicious that in appearance they do not differ at all from the typical chancroid, the secretion being also *auto-inoculable*, as proven by the occasional occurrence of similar lesions upon opposing surfaces.

The venereal ulcer or chancroid acquires its chief importance from its liability to be mistaken for and treated as the initial lesion of syphilis; and the more so as it is often through the lesion established by the destructive agency of the chancroid that the syphilitic principle or disease-germ is permitted entrance into the system. The distinction between the two lesions at the outset is often impossible. The active characteristic of the chancroid is recognized as a necrosis—that of the syphilitic lesion one of growth or proliferation. The surface of a sore, then, may be the field of chancroidal action, while the living tissue beneath may be at the same time a center of proliferation of syphilitic disease-germs, which are constantly gaining access to the general circulation through the contiguous lymphatic vessels. These germs may be originally deposited upon a simple abrasion or one already the seat of chancroidal action, or may be subsequently inoculated through the breach of tissue made by the chancroid. If the former,

the imposition of the secretion of a chancroid upon the same point, if the disease-germs have been freshly deposited, might cause their destruction, and thus leave only the chancroidal element; but once the syphilitic principle has extended below the surface and has entered a lymphatic vessel (see SYPHILIS), it has gone beyond the sphere of action of the chancroid.

The frequent association of chancroid with syphilis will never lead to mistaken identity if it is constantly borne in mind that syphilis is always, in all its manifestations, a process of growth, of proliferation, of exaggerated life. The most scientific and critical examination of the products of syphilis, from the initial lesion to the gummy tumor, has never been able to detect any abnormal material—nothing but excessive accumulations of tissue-building cells. Chancroid, on the other hand, from its inception to its cicatrization, is a process of necrosis—literally, death of tissue. So that syphilis is always and only in relation to chancroid as life to death—each the highest type of its own peculiar action. Revised by ROSWELL PARK.

Venesection: See BLEEDING.

Venetian Carpet: See CARPETS.

Venetian Chalk: the same as French chalk, a soft white talc used by tailors instead of chalk; also used in making pastels and cosmetics.

Veneziano, SEBASTIANO: See PIOMBO, FRA SEBASTIANO DEL.

Venezuela, Span. pron. vā-nāth-wā'lăă (officially, *Estados Unidos de Venezuela*): a republic in the northern part of South America; bounded N. by the Caribbean Sea, N. E. by the Atlantic, E. by British Guiana, S. by Brazil, and W. by Colombia. Area, officially claimed, 597,960 sq. miles; but this includes a tract extending eastward to the river Essequibo, now held by Great Britain as a part of British Guiana, and a vast unsettled tract in the south which is claimed by Brazil. The area of the undisputed territory probably does not exceed 400,000 sq. miles.

Regional Divisions.—Venezuela is naturally divided into four very distinct regions: 1. The mountainous belt of the north and northwest, including, as a sub-region, the lowlands around Lake Maracaibo; this is the agricultural zone and contains at least five-sixths of the civilized population. 2. The llanos, a broad belt, hardly above sea-level, between the mountains and the Orinoco; this is the pastoral zone, thinly settled, but supporting vast herds of cattle. 3. The forest-covered plains of the southwest, almost without civilized inhabitants, but rich in rubber and other natural products. 4. The highlands of Venezuelan Guiana, settled only near the Orinoco, but known to contain valuable deposits of gold.

1. *The Mountain Zone.*—The Eastern Cordillera of the Andes, entering Venezuela from Colombia, divides into two branches, between which is the low basin occupied by Lake Maracaibo and the surrounding swamps. The western branch runs northward, forming the boundary between the two countries, and terminating near the coast. The other, which trends northeastward, covers a wide extent of country, and contains the highest mountains in Venezuela, with extensive high valleys and arid plateaus (*páramos*); five of the peaks rise above the limit of perpetual snow, and one, the Sierra Nevada de Merida, attains 15,400 feet. On approaching the coast this branch ties in with another mountain system which skirts the northern coast from near Lake Maracaibo to Cape Paria, but has an important break near lon. 65° W. This coast mountain region is not very wide, and it generally shows two parallel chains inclosing a fertile valley. The highest peaks are Naiguatá, 9,127 feet, and the Silla of Caracas, a little lower. The name Andes is restricted in Venezuela to the branches of the Cordillera, though geographers have sometimes extended it to the coast system. Neither here nor elsewhere in the country are there any active or quiescent volcanoes; but the whole mountain region appears to be peculiarly subject to earthquakes, and these have occasionally been very destructive. Hot springs are numerous. The mountain lands reach to the coast itself, often rising precipitously from the sea, or broken into deep bays and gulfs which follow the east and west direction of the chains; such are the Gulfs of Cariaco (Cumaná) and Paria, the latter converted into an inland sea by the island of Trinidad to the E. of it. In the N. W. the peninsulas of Goajira and Paraguaná—the latter almost an island—stand out boldly from the coast-line, inclosing the Gulf of Maracaibo. Lake MARACAIBO (*q. v.*) communicates with this gulf and occupies, as we have seen, a depression between two branches of the Cordillera; it is the largest lake in the northern part of South America, and is an interior waterway, its outlet forming an important harbor. Other excellent harbors are those of Puerto Cabello and Cumaná. The most important commercially is La Guaira, which, unfortunately, has few natural advantages, but has been improved by art. Several islands adjoin the northern coast, but the only important one belonging to Venezuela is MARGARITA (*q. v.*). The numerous streams of the mountain zone are short, and, with few exceptions, unnavigable; a large number flow into Lake Maracaibo. Much of the land was originally covered with forest, which remains on the higher slopes. The climate varies greatly with elevation, exposure, and the nature of the soil, but in general the higher lands are temperate and salubrious, while the coasts and the whole basin of Lake Maracaibo are among the hottest regions in South America; in the hot months they are often visited by swamp fevers and dysentery, but severe epidemics of yellow fever are not common. The rainy and warmest months are generally from April to October, varying somewhat with locality. The dry season is well marked.

2. *The Llanos.*—These open pasture-lands are described in a separate article. (See LLANOS.) Though portions might be used for agriculture, they are now exclusively devoted to cattle-raising, and the hardy race of half-breed herdsmen (*llaneros*) inhabiting them has played an important part in the history of Venezuela. Many portions of the plain are even hotter than the Maracaibo basin. During the rains immense areas are flooded, and swamp fever and dysentery are then very common. The principal towns are near the mountain belt. The great delta of the Orinoco is a labyrinth of channels and swampy islands, mainly covered with forest, swarming with mosquitoes, and inhabited only by a few Indians.

3. *The Upper Orinoco Region.*—This region, occupying the southwestern part of Venezuela, is unexplored except near the Orinoco and a few of its branches. The known portion, above the junction of the Meta, is a plain, somewhat higher than the llanos, with some isolated hills or low mountains, and generally covered with forest. A few canoes ascend the river every year to gather rubber and trade with the Indians. Much of this territory is claimed by Brazil or Colombia.

4. *Venezuelan Guiana.*—The southeastern part of the republic, within the great curve of the Orinoco, is physically a part of GUIANA (*q. v.*). It is a region of plateaus and low mountains or mountain-like ridges, some parts, it is said, exceeding 7,000 feet in altitude. So far as known, it contains much open land, interspersed with scrubby growth and forest. The climate, except near the rivers, is temperate and salubrious. The only town is Angostura, on the Orinoco. Some districts near the Orinoco are occupied for cattle-breeding, and rich gold mines have been found near the frontier of British Guiana.

Rivers.—The great river system is that of the ORINOCO (*q. v.*). The main stream and its eastern branches lie entirely in Venezuela, but the western affluents are partly in Colombia. Steamboats ascend to the Atures rapids, and by the Apure and other branches penetrate the interior nearly to the mountains. The remarkable channel connecting the upper Orinoco with the Rio Negro and Amazon is above the rapids and beyond the reach of regular commerce; eventually this and the Colombian affluents must become very important. As it is, the Orinoco is the outlet of the whole republic, excepting the northern mountain region and those portions of the llanos adjoining it.

Natural Productions.—The plants and animals are those of the neotropical region (see AMERICA, SOUTH), closely resembling or identical with the forms found in Brazil. Jaguars, tapirs, various species of deer, etc., are common, except in the more thickly settled regions. The fisheries of the coast and the Orinoco furnish an important food-supply for the poorer classes. Formerly the pearl-fisheries of Margarita, Cumaná, etc., were celebrated, and the name Pearl Coast survives in many maps, but the industry has lost its prestige. The forest products, but little utilized, include rubber, vanilla, tonka-beans, various drugs, and many beautiful cabinet woods. The minerals are important. Gold is widely distributed in the highland districts, and mines were opened soon after the conquest; at present the principal workings are near Carupano, and especially in Venezuelan Guiana, where the famous mine called El Callao has yielded over $3,000,000 a year. The Aroa copper mines, 70 miles W.

of Puerto Cabello, are regularly worked by a British company, and other deposits are reported. Coal of inferior quality is mined near Barcelona. The salt-beds of the Araya peninsula have been worked since the sixteenth century; from these and other salines over 100,000 tons are extracted in favorable years. Asphalt is obtained near the Orinoco delta and around Lake Maracaibo. Guano, phosphate rock, jet, kaolin, lead, tin, etc., are reported. The salt mines are a monopoly of the federal Government, which controls concessions for all other mining enterprises.

Industries.—Agriculture is the leading industry, but is almost confined to the northern mountainous belt; the principal products are coffee, cacao, and tobacco for exportation, and maize, yucca, sugar, beans, etc., for home consumption. Wheat is cultivated on some of the higher plateaus. With few exceptions the agricultural methods are crude and wasteful. Sheep and goats are largely bred, especially in the northwestern districts, where goat-skins (known as Curaçoa kid-skins) are an important article of export. The great herds of cattle on the llanos have nearly disappeared twice —during the war for independence and in the civil wars of 1858–63—but they are now rapidly increasing, and the stock has been improved. In 1888 it was estimated that the country had over 8,000,000 head of horned cattle, 5,700,000 sheep and goats, 2,000,000 swine, 400,000 horses, 300,000 mules, and 860,000 asses. Manufactures on a large scale are almost unknown.

People, Government, etc.—The population (partly estimated, 1891) is 2,323,520; the civilized, originally of Spanish origin, has become more or less mixed with Indian blood, and this mixture exists even in the most prominent families. The Negro element is comparatively small, and is nearly confined to the coast cities. Civilized or semi-civilized Indians, originally gathered in mission villages, still maintain separate communities in some districts; those of the Goajira peninsula are practically independent. The wild tribes, now reduced in numbers, are chiefly confined to the upper Orinoco basin. Immigration heretofore has been scanty. As elsewhere in Spanish America, the cultivated and wealthy class is comparatively small. Slavery was abolished peaceably in 1854. Venezuela is composed of eight states, a federal district, and several territories dependent on the federal Government; formerly there were twenty states. Capital, Caracas. The government is a federative republic, closely modeled after that of the U. S.; but practically the central or state power preponderates according to the party which is in power, and frequently the presidency degenerates into a dictatorship. By the constitution promulgated July 20, 1893, the president is elected for four years. Congress consists of two houses. The Roman Catholic is the common and, to a certain extent, the state religion, but all other cults are protected, and liberty of speech and of the press is guaranteed by the constitution. Primary instruction is free and nominally obligatory; in 1891 there were 1,415 Government, 151 state, and many private schools. The Government maintains a university at Caracas and a smaller one at Merida, several normal and soldiers' schools, academy of fine arts, nautical school, lyceums (*colegios*), seminaries for girls, etc. Caracas has a college of engineers, national library, museum, and observatory. Many Venezuelans finish their education in Europe.

Finances.—The monetary unit is the *bolivar*, or *peseta*, equal to $19\frac{23}{100}$ cents U. S. currency (gold). Silver and gold are coined, and there are two banks of issue, now practically controlled by the Government. The federal revenue is derived chiefly from import duties. The entire foreign and domestic debt in 1894 was 134,787,750 bolivares or about $26,000,000, and as the revenue has frequently exceeded the expenditures (including the service of the debts), this amount could be easily borne. Owing, however, to several defaults and the lack of stability of the Government, Venezuelan bonds are generally far below par in the market.

Commerce, Roads, etc.—The exports amount to about $20,000,000 annually, and the imports are several million dollars less. Coffee is by far the largest item of export, exceeding $14,000,000; others, in the order of their importance, are cacao, gold, hides and skins, copper ore, tonka-beans, dye-woods, and rubber. The countries holding most of the trade are England, the U. S., Germany, and France. Much of the coasting and river trade, partly on vessels flying the Venezuelan flag, centers in the British colony of Trinidad. A railway runs from La Guaira to Caracas, and another from Puerto Cabello to Valencia, with branches; an extended railway system is projected. The common roads are generally bad. Steamboats regularly ascend the Orinoco and some of its tributaries; and there is steam and telegraphic communication with Europe and the U. S.

The metric system of weights and measures is adopted for all Government and legal transactions, and is coming into general use.

History.—The Venezuelan coast was discovered by Columbus in July, 1498, and soon after was frequented by Spanish traders and pearl-fishers. Ojeda, observing Indian houses built on piles near Lake Maracaibo, fancifully compared that region to Venice, and called it Venezuela (Little Venice), a name subsequently adopted for the whole country. Las Casas was granted the right to settle Cumaná, but his missionary colony was destroyed by the Indians in 1522. Soon after Charles V. farmed out the country to a German commercial house, the Welsers; expeditions sent by them founded Coro (1527), which became the center of exploration and settlement. The Indian tribes were destroyed or reduced to slavery during the succeeding forty years; Caracas was founded in 1567. Subsequently Venezuela was much neglected; it was ruled by captains-general who, in the eighteenth century, were partly controlled by the viceroys of New Granada. Venezuela was one of the first colonies to revolt from Spain in 1810, and independence was declared in 1811. The movement, of which Miranda became the leader, failed, partly owing to the great earthquake of Mar. 26, 1812, which destroyed Caracas and other cities; the patriots were impoverished and many, supposing that the disaster was a token of divine wrath against rebellion, joined the royalists. The war broke out afresh, the colony uniting with New Granada in the republic of Colombia; the principal patriot leader and first president was the Venezuelan BOLIVAR (*q. v.*). After many vicissitudes Bolivar's victory at Carabobo, June 25, 1821, broke the Spanish power. In 1830 Venezuela seceded from Colombia, and she has since remained independent. Except for transient revolts and a more serious one in 1848–49, the country enjoyed peace until 1859; a civil war then broke out which, after four years, resulted in the overthrow of the Government and the accession to power of Falcon and his successor, Guzman Blanco. Since then there have been frequent disturbances, and in 1892 President Andueza Palacio was overturned by Gen. Joaquin Crespo, who was regularly elected president under the new constitution in 1894. The question of the boundary with British Guiana has long been a cause of dispute between Venezuela and Great Britain. For the literature of Venezuela, see SPANISH-AMERICAN LITERATURE.

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Venezuela, Gulf of: See MARACAIBO, GULF OF.

Venial Sin [*venial* is viâ O. Fr. from Lat. *venia'lis*, pardonable, deriv. of *ve'nia*, pardon, remission]: a term used in Roman Catholic theology, in contradistinction to mortal sin, to denote those lesser transgressions of the laws of God or the Church, which, though blamable, are not sufficient to destroy the union of friendship existing between God and the soul. J. J. KEANE.

Venice [Ital. *Venezia*; cf. Lat. *Vene'tia*, country of the *Ven'eti*]: a city and fortress of Italy, once the capital of a rich and powerful republic, now the chief town of the province which bears its name (see map of Italy, ref. 3–D). It lies in the Adriatic on 118 small islands and shoals in the Gulf of Venice, between the mouth of the Piave on the N. and the Adige on the S. These islets in the lagoons, made on piles petrified by time and by the deposits of the Brenta and other affluents of the Adriatic, are connected by 378 bridges, sufficiently elevated to allow boats to pass freely under them. By means of the small strips of land artificially built on piles around the edifices, and about 200 smaller or greater open spaces called *campos*, as well as the bridges, a slender land communication is kept up through the city, but most of the business and amusement is carried on through the 157 canals which not only form the highways, but also penetrate every alley of the city. The Grand Canal divides the city into two unequal portions and is spanned by the magnificent Ponte-Rialto, a marble arch built by Antonio da Ponte in 1588–91, and two iron bridges built in 1854 and 1858. Since 1845 Venice has been connected with the mainland by a railway bridge $2\frac{1}{4}$ miles long, and is thus brought

within an hour's ride from Padua. This bridge is built on some 80,000 piles and consists of 222 circular arches of about 33 feet span each. The supply of drinking-water is now brought from the mainland.

Institutions, Industries, and Commerce.—The population of Venice had dwindled from 190,000 in the fifteenth century to half that number at the beginning of the nineteenth century, but has risen again to 150,900 (Dec. 31, 1893). Venice is the seat of a prefect, supreme court, a Catholic patriarch, and an Armenian archbishop, and has an academy of sciences, one of the richest libraries in Europe, a conservatory of music, the Academy of Beaux-Arts with extremely valuable collections of painting, an archæological museum, a permanent art exposition, and several schools, besides five theaters. Since Venice has been connected by the railway bridge with the railway system on the mainland and since the opening of the Suez Canal, commerce has greatly increased; in 1885 2,732 ships with a tonnage of 824,291 entered the harbor. This, however, can not be compared with the trade of the city in 1421, when it gave employment to 3,345 ships with 36,000 sailors and 16,000 dock-laborers. The trade is principally in grain, oil, hemp, cotton, raw silk, wine, and petroleum. The chief articles of manufacture are glass and mosaic wares, artificial pearls, silk, velvet, lace (this famous industry having been revived), wax, soap, artistic furniture, jewelry, and artificial flowers. Venice is connected with Trieste and the Orient by steamship lines. Coal and iron have to be imported, chiefly from Great Britain, as Italy produces but little of these articles. Ship-building is carried on at six wharfs.

Churches and other Public Buildings.—There are few squares and gardens of any extent in Venice; chief among them are the Giardino Publico at the eastern end of the city and the grounds adjoining the royal palace. The Piazza San Marco on the Rivo Alto (Rialto), surrounded by palaces and archways and paved with trachyte and marble blocks, is the great square of Venice and the center of its life. At the eastern end of the Piazza stands that wonderful monument of Oriental Greek architecture and Roman style combined, the Basilica of San Marco, begun in 828 and built during 976–1071 to receive the bones of the evangelist St. Mark, which are believed to have been brought there by the Doge Giustiniano Partecipazio (827–830) from Alexandria, Egypt. The façade of this church, dating from the fourteenth century, is composed of two tiers of round arches, five in each tier, the center arch of both rows being larger than the others. These arches are supported by innumerable columns of great beauty; the spaces over the doorways, etc., are covered with rich mosaics and other most elaborate ornamentation; and above the central portal stand four bronze horses, brought from Constantinople in 1204, and undoubtedly of Hellenic workmanship. The whole edifice is surmounted with pinnacles and domes so perfect in form and arrangement as to produce a finish of the most exquisite symmetry and fitness. The vestibule is entered by five bronze doors of superb workmanship, is vaulted with mosaics from designs by Titian, and contains very interesting sepulchral monuments, splendid columns, and other architectural features, and countless objects of veneration collected in the various chapels, in the sacristy, and elsewhere. On the right of the Basilica of San Marco, to the rear, rises the Torre dell' Orologio, or Clock Tower (1494), with its gorgeous dial-plate of blue and gold, above which stand the famous bronze Moors with iron hammers. Besides San Marco there are ninety-eight other Roman Catholic churches, several Protestant and Armenian churches, and seven synagogues. Noteworthy among the first-named is the Chiesa dei Frari (1250), which contains, besides exquisite pictures by G. Bellini, Titian, etc., several very remarkable tombs of great artistic merit and two modern monuments, one in honor of Titian, the other in memory of Canova. In the conventual buildings connected with this church are kept the archives of Venice, said to contain at least 140,000 documents of all dates from the ninth to the nineteenth century. Among the architectural features of Venice the Palazzo Ducale, or doge's palace, is conspicuous. Begun in 1350 by Filippo Calendario, it was completed in 1442, and holds a high rank with its superb works of art and impressive beauty. In its court is the famous giant stairway with its colossal statues of Neptune and Mars. It has on the east the famous Bridge of Sighs (*ponte dei sospiri*) leading to the ancient state prisons, known as the *piombi* (lead-roofs). The magnificent hall of the Great Council, with the adjoining rooms, has held since 1812 the famous Library of St. Mark, with its MS. treasures and its many pictures, including Tintoretto's *Paradise*, the largest oil-painting in the world. In the eastern wing of the palace is the Archæological Museum, with Greek works of sculpture. Opposite the Palazzo Ducale is the ancient library building, now a royal palace, the masterwork of Sansovino, to the right the magnificent mint (*la Zecca*), built by Sansovino. There are many other magnificent palaces in Moorish, Gothic, and early Renaissance styles. The two granite columns (brought from the East in 1127) at the southern end of the Piazzetta, the one surmounted by a statue of St. Theodore and the other by the Lion of St. Mark, were considered as especially symbolic of the republic, and were copied in many of her subject cities.

History.—This began when the Veneti, probably of Illyrian stock, lived on the northeastern bay of the Adriatic. In 452 Attila, King of the Huns, destroyed Aquileja and conquered all the country as far as the Po. At that time fugitives from all parts of the ravaged countries concealed themselves in the lagoons, and gradually founded island-towns like Grado, Heraclea, Malamocco, and Chioggia, governed by tribunes. After the downfall of the Western Roman empire in 476 the Venetian islands were subjected to Odoacer, then to the Ostrogoths, and finally to the Byzantine empire. Even after the invasion of the Lombards in 568 they remained under Byzantine dominion, but repeated wars with the Lombards made a closer union and a uniform government a necessity. Therefore all the classes of the island communities elected in 697 A. D. Paoluccio Anafesto as their supreme chief for life under the title of duke or doge. The ducal residence was at first Heraclea, after 742 Malamocco, but was removed in 810 to the heretofore deserted island of Rialto, which became the central island of the city of Venice, connected by the Doge Agnello Partecipazio with all the neighboring islets by means of many bridges. In 827 the body of St. Mark was surreptitiously taken from Alexandria in Egypt and transported to Venice. The apostle became the patron saint of the republic, and the Cathedral of St. Mark was immediately designed and begun. A period of peaceful development followed for the republic, which skillfully used its advantageous position between the Western and Eastern empires to become the richest and most powerful commercial city of Europe, and to expand its mercantile relations so far as the Crimea and Tartary. Its fleets fought successfully against the Normans and Saracens of Southern Italy, as well as against the Slavonic pirates of the Adriatic Sea; Istria was conquered, and the towns of the Dalmatian seacoast subjected themselves voluntarily to the protection of Venice in 997. Though actually independent, the republic still maintained the appearance of a political union with the Byzantine empire for commercial reasons. During the crusades Venice spread its influence over the entire Levant in spite of the competition of Pisa and Genoa. Meanwhile internal dissensions between the aristocratic and democratic factions brought about an insurrection; the Doge Vitale Micheli was killed and the so-called *Great Council*, consisting of elected *Nobili*, was established in 1172 to limit the well-nigh absolute power of the doges and the signoria (of six councilors). Under this constitutional aristocracy legislation and administration developed a more liberal spirit.

In 1204 the Doge Enrico Dandolo, with the aid of French crusaders, conquered Constantinople and acquired the lion's share of the Græco-Latin empire and the island of Candia (Crete). The art-treasures of the East were carried to Venice, and a noble school of artists sprang up to celebrate the royal grandeur of the doges. The republic, however, was unable to prevent the overthrow of the Latin empire at Constantinople in 1261, and the Genoese, with whom Venice had been at war since 1256, then gained the favor of the Byzantine emperors. In the meanwhile the oligarchic constitution at home was becoming more firmly fixed, and at the end of the century Venice had really ceased to be a democracy. The Doge Marino Falieri, having conspired against the aristocracy, was executed in 1355. The changed relations to the Orient induced the republic to replace the losses sustained in the Levant by gains in Italy, especially after the final defeat of Genoa in 1381. Its possessions on the mainland became more and more considerable. Vicenza, Verona, Bassano, Feltre, Belluno, and Padua with their territories, were gained in 1404 and 1405, Friuli in 1421, Brescia and Bergamo in 1428, Crema in 1448, the Ionian islands in 1483, and Cyprus was ceded to the republic by Catarina Cornaro, the widow of the last king, in 1489.

Thus the republic flourished at the end of the fifteenth

century in material wealth and power, as well as in art and science; its people were the most educated in Christendom; its commerce and industry spread all over the then known world. But after da Gama's discovery of the maritime route to Eastern India in 1498, Venice gradually lost its important Indian trade. The westward advance of the Turks, especially after the fall of Constantinople in 1453, ruined Venetian commerce in the enormous sphere of Turkish influence in Europe, Asia, and Africa; the republic lost its possessions in the Archipelago and Morea, also the Albanian territory and Negropont. The League of Cambrai, necessitating a wavering policy between Charles V. and Francis I., and incessant collisions at home and abroad, reduced the republic for a time to the verge of destruction, and ruined its commerce and industry. In spite of the greatest heroism in the wars of the republic against the Turks, Cyprus was lost in 1571, and after a twenty-four years' war in which Candia was most heroically defended, this island was surrendered in 1669, although several fortresses were held by the Venetians till 1715. Morea, which had been reconquered by Venice in 1687, was lost forever in 1718 by the treaty of Passarowitz. Here ended the international importance of the republic, which endeavored from this time on to preserve its old constitution and its home possessions in perfect neutrality, i. e. Venetia, Istria, Dalmatia, and the Ionian islands, with about 2,500,000 inhabitants; but when the republic in 1796 sought an alliance with Austria against Napoleon, a fierce war began, which ended with the resignation of the last doge, Ludovico Manin, the dissolution of the Great Council May 12, 1797, and the occupation of the city by the French.

By the treaty of Campo Formio, Oct. 17, 1797, the Venetian territory on the left of the Athesis, with Istria and Dalmatia, was ceded to Austria, and there began the most unfortunate period in Venetian history, a succession of secret conspiracies and revolutions against Austrian domination. After the heroic revolution of 1848, which was suppressed by the famous Austrian general Radetzky, Venice once more fell into the hands of the exasperated Austrians, who held it in a state of siege till 1854. Even the combined forces of Napoleon III. and Victor Emmanuel of Sardinia in 1859 did not relieve Venice from the Austrian dominion. With the mainland up to the Mincio river it remained Austrian until the unnatural relation was dissolved in 1866, owing to Austria's war with Prussia. Emperor Francis Joseph of Austria was successful against the Italians when they crossed the Mincio, yet, owing to the defeat of the Austrian arms on the battle-fields of Bohemia, ceded Venice to Napoleon III., who turned it over to Victor Emmanuel, King of United Italy. On Nov. 7 the king entered the city in solemn procession.

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Venice White: See BARYTA.

Veni Creator Spiritus [Lat., Come Creator Spirit, the opening words of the hymn]: a hymn of the Roman Breviary; probably composed by Pope Gregory I. (540–604), though it was once ascribed to Charlemagne. It is written in correct meter, according to the quantity of the syllables, and its Latinity is good. It is used in the ordinals of Anglican and American churches. Dryden's translation of it is one of the best. The shorter of the two forms of this hymn, found in the office for "the Ordering of Priests" and "the Consecration of Bishops" is more generally used; the longer form being rather a paraphrase than a translation. When used it is sung or said line by line alternately by the bishop, and the clergy and congregation. It is not infrequently used in the American Church at the administration of confirmation as indicating the *quasi* setting apart and ordination of the laity to a spiritual kingship and priesthood. There are several other English translations. The two most commonly found in hymnals begin "Come, O Creator Spirit, blest," translated by Rev. Edward Caswall in 1849, and "Come, Holy Ghost, all-quickening fire," translated by Bishop John Cosin in 1627. This and the Creator Sancti Spiritus are of the "seven great hymns of the mediæval Church." See STABAT MATER. Revised by W. S. PERRY.

Venire facias, ve-nī′rĕc-fā′shi-ăs, or (more commonly) simply **Venire**: an ancient common-law judicial writ directed to the sheriff, commanding him to select and cause to come (*venire facias* is Lat. for "cause to come") from the body of the county before the court on a day named a specified number of qualified citizens to act as the jurors at such court. At the common law the selection of the jury is left entirely in the hands of the sheriff, who upon receiving the writ selects and summons the proper number from among the citizens of the county, and returns their names with the writ. This method has been abolished or modified by statute in Great Britain and in most, if not in all, of the States of the U. S., but it still prevails wherever not abrogated by statute, and in case of emergency may still be used where it is so supplanted. The statutes generally provide that from the lists of qualified persons, prepared at stated intervals (usually once a year) and kept by certain officials in each county, the *panel*—that is, the requisite number of jurors for a court—shall be drawn by lot. The list thus drawn is certified to the sheriff, who summons the persons named therein without a regular venire being issued to him, though the venire may still be necessary when, the original panel having been exhausted, additional jurors must be summoned in special cases. The common-law mode of obtaining additional jurors, in case of failure to secure a sufficient number from those summoned, was by selecting from such bystanders as were competent enough persons to fill up the number of the jury, and this method is still generally used, unless expressly prohibited by statute. The term *venire facias de novo*, or *venire de novo*, is the old technical expression for a venire issued when a verdict has been set aside and a new trial ordered because it is so imperfect or ambiguous that no judgment can be given on it, or issued when there has been some fatal irregularity or impropriety in returning the jury under the first venire. The term *venire facias* is also applied to a writ issued as the first step in outlawry proceedings for a misdemeanor in England. See Stephen's *Commentaries on the Laws of England*; Forsyth's *History of Trial by Jury*; Bigelow's *History of Procedure in England*. F. STURGES ALLEN.

Veni Sancte Spiritus [Lat., Come Holy Spirit, the opening words of the hymn]: a hymn of the Roman Missal; ascribed to King Robert II. of France (d. 1031 A. D.). It is in the mediæval Latin, is rhymed, and its meter is not according to quantity. It is a sequence in the Mass for Whit-Sunday and its octave, and is one of the loveliest and most tender of the Latin hymns.

Venloo, ven-lō′, or **Venlo**: town; province of Limburg, Netherlands; on the Meuse; 60 miles N. W. of Cologne (see map of Holland and Belgium, ref. 8–H). It is narrow and irregularly built, is an important railway center, and contains an arsenal, powder-mills, magazines, and hospitals. Its manufactures include cigars, needles, and gin. Pop. (1890) 11,397.

Venn, HENRY: clergyman and author; b. at Barnes, Surrey, England, Mar. 2, 1724; educated at Bristol and at Jesus College, Cambridge, where he graduated 1745; took orders in the Church of England; became fellow of Queen's College 1749, curate of Clapham 1754, vicar of Huddersfield, Yorkshire, 1759, and rector of Yelling, Huntingdonshire, 1771. He was a leader among the Evangelicals. D. at Clapham, June 24, 1797. He was the author, among other works, of *The Complete Duty of Man, or a System of Doctrinal and Practical Christianity* (1763), a Calvinistic work which obtained great popularity and was often republished (9th ed. 1807). His *Life and Letters* were published in 1834 by his grandson, Rev. Henry Venn. Revised by S. M. JACKSON.

Venn, JOHN, Sc. D., F. R. S., F. S. A.: logician; b. at Kingston-on-Hull, Yorkshire, England, Aug. 4, 1834; educated at schools in London, and in Caius College, Cambridge. He has been lecturer in Moral Science in Caius College since 1862; was Hulsean lecturer 1867–70, etc. His principal works are *Logic of Chance* (1866; 3d ed. 1887);

Characteristics of Belief (Hulsean Lectures, 1870); *Empirical Logic* (London, 1889); *Symbolic Logic* (1881; 2d ed. 1894). J. M. B.

Venom [M. Eng. *venim*, from O. Fr. *venim*, *venin* > Fr. *venin* < Lat. *vene'num*, poison]: the poison elaborated as a normal secretion by certain glands of animals, as distinguished from *virus*, the virulent liquid excrementitious or abnormal product of animals or man, usually a product of disease. Some insect stings are virulent, though as a rule they are mild and relieved by simple measures. A bee or wasp usually leaves its sting in the wound it inflicts; this should be extracted, and the wound protected from the air and bathed in cooling and stimulating evaporating lotions; weak ammonia is a useful application. The scorpion is dangerously venomous in the tropical regions of the Indies and Africa, but in the milder climates it inhabits it does little harm. The tarantula's venom, contrary to the fabulous accounts, rarely causes death, and seldom occasions even alarming symptoms. In nearly all countries there are venomous serpents, their number diminishing with an increase of population and a high cultivation of the soil. Islands are comparatively free. Ireland is said to be quite free, and England has but one, the viper. The chief venomous serpents of the U. S. are the rattlesnake, moccasin, copper-head, harlequin, and adder. The phoora of India and the cobra are exceedingly virulent. The venom of serpents is elaborated in special glandular apparatus adjacent to the mouth, stored in a sac or canal, and reserved for sudden voluntary ejection as a part of the reptile's means of defense and offense. See POISON OF SERPENTS. Revised by E. T. REICHERT.

Venosa, vā-nō'săa (anc. *Venusium*): commune and city of the province of Basilicata, in Southern Italy; about 20 miles N. of Potenza (see map of Italy, ref. 7-G). It is celebrated as the birthplace of the poet Horace and as the scene of the defeat and death of the Roman consul Metellus in a battle with the Carthaginian troops under Hannibal. Venosa is mentioned by Diodorus and Dionysius as a town of great antiquity and importance, but we know nothing of the details of its early history, except that it belonged to the Samnites before its incorporation into the Roman state. It lies in a salubrious, fertile, and picturesque region. Pop. about 8,000. Revised by M. W. HARRINGTON.

Venous Blood [*venous* is from Lat. *veno'sus*, veiny, full of veins, deriv. of *ve'na*, vein. See VEINS]: the dark-colored fluid collected from every part of the system by the veins. It subsequently becomes mixed with the *chyle*, or nutritious portion of the food, and is ultimately exposed to the modifying influences of the air as it passes through the lungs, whereby it is converted into bright-red arterial blood. (See BLOOD.) Besides the difference between venous and arterial blood in color, several distinctions in physical and chemical properties are presented. The specific gravity of venous blood is greater than that of arterial blood; it does not coagulate so rapidly, and contains more corpuscles, but less fibrin. Its serum contains less water and extractive matter, but more fat, than that of arterial blood. Corpuscles from venous blood contain 3·57 per cent. of fat; those from arterial blood contain but 1·84 per cent. The differences in color presented by the blood-corpuscles appear to be dependent, to a certain extent, upon their shape and upon the amount of hæmatin present. The florid color of arterial blood is due to oxidation of the hæmoglobin. Venous blood contains more carbonic acid, but less oxygen, than arterial. In 100 volumes there exist—nitrogen, 13; carbonic acid, 71·6; oxygen, 15·3; arterial blood containing nitrogen, 14·5; carbonic acid, 62·3; oxygen, 23·2. Venous blood does not evolve oxygen when placed in an atmosphere of nitrogen, as is the case with arterial blood.
Revised by W. PEPPER.

Ventilation: See WARMING AND VENTILATION.

Ventricles: See HEART.

Ventril'oquism [deriv. of *ventriloquy*, from Mediæv. Lat. *ventriloquus*, one who (apparently) speaks from the belly; Lat. *venter*, belly + *loqui*, speak]: the art of so managing the voice as to cause the illusion that its origin is from some other source than the vocal organs of the speaker. It was undoubtedly known to the ancients. The etymology of the word indicates the idea formerly entertained in relation to the nature of the performance, but it is now well known that the sound does not come from the abdomen. Again, it was conceived that the ventriloquist spoke during inspiration instead of expiration, and that thus illusions in regard to locality and distance were produced. It is undoubtedly true that modulated voice may be formed by inspiring air through the vocal organs, but it is equally certain that the sounds which result have little or no analogy with those of the ventriloquist, and are not calculated to cause the deceptions which the accomplished performer so readily produces. In reality, the words uttered by the ventriloquist are formed in precisely the same manner as in ordinary articulation, the difference consisting mainly in the mode of respiration. A very full inspiration is taken, and then the air is expired slowly through a narrowed glottis, the diaphragm being kept in its depressed condition and the thoracic muscles alone being used to empty the lungs. At the same time the lips are scarcely moved, and the deception is still further facilitated by the attention of the auditors being directed to the object which the performer wishes to be regarded as the source of the voice.

Ventura, Cal.: See SAN BUENA VENTURA.

Ventura de Raulica, -row'lĕe-kăa, GIOACCHINO: preacher; b. in Palermo, Sicily, Dec. 8, 1792; was educated by the Jesuits, but entered the order of the Theatines; became general of the order in 1824, and settled in Rome, where he enjoyed the confidence of Popes Leo XII., Pius VIII., and Gregory XVI., and exercised considerable influence even on the diplomatic business of the papal government. He was a disciple of Lamennais. "The pope and the people" was his device; the establishment of free institutions under the tutelage of the Roman Catholic Church was his ideal; but his work *De Methodo Philosophandi* (1828) in defense of the scholastic philosophy provoked an attack by Lamennais, who afterward openly rebelled against the Church. Ventura attempted to bring about a reconciliation, but failed, and retired from the papal court in 1836. For about ten years he devoted himself to literary work and to preaching. His eloquence as an orator earned for him the title of the "Italian Bossuet." With the accession of Pius IX. he returned to the court, and his influence, as well as his popularity, grew rapidly. In 1847 he delivered a funeral oration over O'Connell, which gave him great influence with the people, and when, in 1848, the revolution against the Bourbons broke out in Sicily, he openly espoused the cause of his countrymen with great fervor, and wrote *On the Independence of Sicily*, *On the Legitimacy of the Acts of the Sicilian Parliament*, and *Mensonges diplomatiques*. But the revolution in Rome and the flight of Pius IX. to Gaeta destroyed his hopes. On May 4, 1849, he fled from Rome; settled in Montpellier, and removed in 1851 to Paris, where he preached in French to large audiences in the imperial chapel in the Tuileries and in the Madeleine, and published many voluminous works, including *Histoire de Virginie Bruni*, *Les Femmes de l'Évangile*, *La Raison philosophique et la Raison catholique*, *Sur l'Origine des Idées*, and *La Femme catholique*. D. at Versailles, Aug. 2, 1861. Revised by F. M. COLBY.

Ventu'ri, LUIGI: author; b. at Pavia, Italy, 1812; was educated in the *scuole pie* of Florence; took service at the ducal court, and, during the troubles of 1859, held an important position under the Archduke Leopold II.; afterward engaged in literary pursuits. D. in 1890. Some of his publications are *L'uomo, i canti biblici* (Pisa, 1866), in verse; *Similitudini dantesche* (Florence, 1874), a collation of parallel passages from Dante and other poets; *Michael Angelo Buonarotti*, *Ricordo al popolo italiano*, biographical and other remarks upon the artist and poet, furnished for the Michelangelo celebration of 1875; *Alessandro Manzoni, gl'inni sacri ed il cinque Maggio* (Florence, 1876), a commentary; *Gl'inni della Chiesa* (Florence, 1877), with translations and explanations. Nearly all his works have gone through several editions; an early collection is *Versi e prose di Luigi Venturi* (Florence, 1871). J. D. M. FORD.

Venue [from O. Fr. *venue*, a coming, deriv. of *venir* (past partic. *venu*) < Lat. *veni're*, come]: originally the neighborhood or place where the facts are alleged to have occurred, and from which, therefore, the jury was to come that should try the issue. In the later meaning of the term, and the one which it now has, it denotes the county or jurisdiction in which a cause is to be tried. In indictments the venue is given in a marginal notation; and in common-law practice the declaration designates the place in which the cause is to be tried, the term venue being applied also to the designating part of the indictment or declaration.

In criminal actions the venue must be the county where the act was committed, except in the case of continuing

offenses, those done partly in two or more counties, etc., in which cases the venue may be chosen from among the counties in which any part of the offense was committed. By the common law a grand jury could not indict or present any offense which did not arise within the county or precincts for which they were returned, but the powers of the jury have been extended in some cases by statute.

In civil cases the venue was, at common law, either local or transitory, according as the action itself was local or transitory. Local actions were those which necessarily referred to some particular locality, as in the case of trespass upon land, and in these the venue had to be laid in the county in which the cause of action arose. Transitory actions were those which might take place anywhere, such as trespass to goods, batteries, etc., and in these cases the venue could be laid in any county at the plaintiff's option, and no venue could be changed except by order of a court or judge, or by the consent of the parties. These rules still prevail except where abolished by statute. In England it is provided that, except in specified cases, there shall be no venue for any civil action, and that when the plaintiff proposes to have the action tried in any other county than Middlesex he shall name the proposed county or place in his statement of claim or complaint. In the U. S. most of the States have statutes regulating the subject, and in general providing that the venue, especially in the lower courts, must be laid in either the county where one of the parties resides, or where the cause of action arose. The venue may be changed in civil causes to prevent great inconvenience to witnesses, and in both civil and criminal causes to promote the ends of justice. The causes, occasions, and modes of change are regulated by statute.

See Stephen's *Commentaries on the Laws of England*; the treatises of Gould, Chitty, and Stephen on *Pleading*; and the statutes of the various States. F. STURGES ALLEN.

Venus: in Roman mythology, the goddess of spring, generation, sensual love, etc. She seems to have played no very prominent part in the oldest epoch of Roman civilization, but became afterward completely identified with Aphrodite, the Greek goddess of love, and appropriated to herself all the myths belonging to the Greek deity, without adding a single one of Roman origin—her birth from the foam of the sea, her coming from Cyprus or Cythera, her marriage with Hephæstus (Vulcan), her amours with Ares (Mars), Hermes (Mercury), Adonis, Anchises, and others. Of special Roman interest was her adventure with Anchises, to whom she bore Æneas, the founder of Rome. Originally, however, Aphrodite was not a Greek creation either, but was introduced to Greece from Asia, where she was worshiped under a variety of names. The myth of Adonis is also of Asiatic origin. Revised by J. R. S. STERRETT.

Venus [= Lat., named from the Roman goddess *Ve'nus*]: the second planet in order of distance from the sun, and the next neighbor of the earth within its orbit. Venus travels at a mean distance from the sun of about 67,000,000 miles, and the eccentricity of the orbit being only 0·006845, its greatest distance exceeds its least distance by only 917,000 miles. Venus when nearest to the earth, at a distance of about 25,000,000 miles, is invisible, being lost in the sun's rays, and it is most favorably placed for observation when near its elongations, when it appears like a half moon, or slightly gibbous or slightly horned. It lies then much farther from the sun's place in the heavens than Mercury when that planet is at its elongations, for the elongations of Venus range from about 45° to about 47⅛°. Venus completes a sidereal revolution in 224·7008 days on a path inclined 3° 23½′ to the ecliptic, but its synodical revolution is much greater, amounting to 583·920 days, which is the mean interval between successive inferior conjunctions or between successive superior conjunctions. Half this period, or 291·960 days, is the interval between successive conjunctions, which are of course alternately inferior and superior. Between inferior conjunction and the next superior conjunction Venus is a morning star, while between superior conjunction and the next inferior conjunction it is an evening star. Venus has a diameter estimated at about 7,650 miles. Its density is slightly less than the earth's. The telescopic study of this beautiful planet has not been attended by results so interesting as might have been expected from its proximity. Some astronomers, indeed, claim to have seen spots and markings upon the surface of Venus; but the best observers, using the most powerful telescopes, have uniformly failed to see what inferior observers have imagined they have discerned with relatively imperfect instruments. Sir John Herschel remarks that "the surface of Venus is not mottled over with permanent spots like the moon; we perceive in it neither mountains nor shadows, but a uniform brightness, in which we may indeed fancy obscurer portions, but can seldom or never rest fully satisfied of the fact." Still, observations have led to results tolerably accordant *inter se*. Thus the elder Cassini deduced a period of 23 hours. Bianchini indeed inferred from his observations the monstrous rotation-period of 24 days 8 hours, but the younger Cassini showed that all Bianchini's observations could be reconciled with the elder Cassini's by taking for the rotation-period 23 hours 21 or 22 minutes; and as Bianchini's observations were not continued during several consecutive hours at each sitting, owing to the want of sky-room at his place of observation, this interpretation must be accepted as the more probable. Later, the industrious Schröter attacked the problem, and reduced the supposed rotation-period to 23*h*. 21*m*. 19*s*., while de Vico, by combining his own observations with those of Bianchini and Cassini, deduced the rotation-period 23*h*. 21*m*. 15*s*. Later, Schiaparelli, of Milan, published a series of papers in which he claims that Venus always presents the same face to the sun, just as the moon does to the earth. This conclusion is not yet established by other observers, and the above-quoted view of Sir John Herschel still expresses the best opinion on the subject.

Venus, like Mercury, transits the face of the sun, but at longer intervals. Its transits are more important than those of Mercury, because, being nearer to us when in transit, its position on the sun is different for observers differently placed on the earth. Transits of Venus occur only when the planet is in inferior conjunction near one of its nodes. These lie in longitudes 75° 19′ and 255° 19′, and the earth passes these longitudes respectively on or about Dec. 7 and June 6, so that transits can occur only near these dates. If a conjunction has occurred near the place for December transits, another will occur there 243 years later under very nearly the same conditions; but usually a pair of transits will occur near this date, separated by eight years, so that, for instance, we have a December transit in 1631 and another in 1639, followed by a transit like the first of the pair in 1874 (1631 + 243), and a transit like the second of the pair in 1882 (1639 + 243). The following are the dates of these transits during seven centuries:

1631, Dec. 7.	2004, June 8.
1639, Dec. 4.	2012, June 6.
1761, June 5.	2117, Dec. 11.
1769, June 3.	2125, Dec. 8.
1874, Dec. 9.	2247, June 11.
1882, Dec. 6.	2255, June 9.

See SOLAR PARALLAX and TRANSITS OF VENUS AND MERCURY. Revised by SIMON NEWCOMB.

Venus's Flower-basket: the *Euplectella speciosa*, a siliceous sponge found near the Philippine islands, consisting of a delicate lace-like skeleton or framework, which, when the enveloping animal tissue is removed, forms a cornucopia 12 or 15 in. high and 2 in. wide. J. S. K.

Venus's Fly-trap: See DIONÆA.

Venus's Girdle: See CTENOPHORA and GIRDLE OF VENUS.

Vera: town; in the province of Almeria, Spain; on the Almanzora, near its entrance into the Mediterranean (see map of Spain, ref. 19–G). It has a small harbor, through which it carries on some export and import trade. Its manufactures of niter are important and its fisheries considerable, and there are many mines in the vicinity. Pop. (1887) 8,610.

Vera Cruz, Span. pron. vā′rāă-krooth′: an eastern maritime state of Mexico, surrounded by the Gulf of Mexico, Tabasco, Chiapas, Oajaca, Puebla, Hidalgo, San Luis Potosí, and Tamaulipas. Area, 27,454 sq. miles. It forms a long strip, extending southeastwardly along the Gulf, with an average width of about 50 miles. Near the coast the surface is generally low, flat, or rolling, with occasional hills and extensive swamps and lagoons. Northwardly this coast strip includes nearly the whole width of the state, but elsewhere it is narrowed, rising to high mountains on the western and southwestern frontier. Orizaba, on the Puebla boundary, is the highest peak in Mexico and possibly in North America. Spurs and isolated peaks break the lowlands in the southeastern part, and one mass, the volcano of Tuxtla, near a headland on the coast, rises to a height of almost 5,000 feet. The extreme southeastern end of the state

includes the eastern part of the Isthmus of TEHUANTEPEC (*q. v.*). Numerous short rivers flow down from the mountains, the most important being the navigable Panuco on the northern frontier; the lagoon of Tamiahua is also navigable and forms a means of interior communication. The climate of the coast belt is warm and in the summer months often insalubrious, yellow and swamp fevers prevailing. The higher lands are temperate and healthful. Heavy forests cover the mountain-sides, extending in some places to the coast. Much of the land is very fertile. Vera Cruz is an agricultural state, and is especially noted for the excellence of its tobacco and coffee. These, with sugar, cotton, and vanilla and cabinet-woods from the forest districts, are largely exported. There are considerable manufactures, especially of coarse cotton cloths and cigars. The mines at present are unimportant. Pop. (1893) estimated, 641,824. The official capital is Jalapa, but the legislature often meets at Orizaba. HERBERT H. SMITH.

Vera Cruz: the most important port of the state of Vera Cruz and of Mexico: on an indentation of the Gulf coast; about 180 miles (263¼ miles by railway) E. of Mexico city (see map of Mexico, ref. 7–I). Here a small and badly sheltered harbor is formed by a narrow channel between the beach and a line of low reefs. It is open to the N., and during the "northers" or winter storms, common on this coast, vessels have frequently been wrecked before the city. At such times it is impossible to land freight or passengers, and steamers commonly put out to sea until the storm has passed. Vessels drawing 26 feet can pass behind the reef, but large ones often anchor in the open roadstead. A breakwater now (1895) in course of construction will make the harbor safer, but it can never be a commodious one. The city is built on flat and barren land, and it has no notable buildings. The chief attraction is a shaded square near the water front. The climate is unpleasantly warm, and Vera Cruz is one of the most unhealthful places in Mexico. Epidemics of yellow fever occur regularly every summer, and there are occasional cases even in the winter. Notwithstanding these disadvantages, Vera Cruz has always been the chief commercial gate of Mexico, a great part of its import and export trade centering here. The railway to Mexico, completed in 1873, gave it a great impetus. An interoceanic line to Acapulco, passing through Jalapa and Puebla, is (1895) nearly finished, and others are projected. The city has important manufactures of cigars. Vera Cruz is the oldest Spanish settlement in Mexico, having been the landing-place of Cortés when he began the conquest. The first town, called Villa Rica de Vera Cruz, was moved soon after to the harbor of Bernal, and in 1525 to another point now called Old Vera Cruz. The present town dates from 1599. It was sacked by corsairs in 1653 and 1712; was taken by the French in 1838; bombarded and taken by the U. S. fleet and forces Mar., 1847, and became Gen. Scott's base of supplies during his march to Mexico; and was again taken by the French in Dec., 1861. It has repeatedly figured in the war for independence and the civil struggles. During the "reform war," 1859–60, it was the headquarters of Juarez. On one of the reefs fronting the city is the celebrated fort or castle of San Juan de Ulúa, built in the seventeenth century as a protection against pirates. It was the last post held by the Spaniards in continental North America, surrendering Nov. 18, 1825. It has long been a place of confinement for political prisoners. Pop. of Vera Cruz (1895) about 30,000. HERBERT H. SMITH.

Veragua, vā-raa'gwăă: originally a part of the Caribbean coast of Central America, including Southeastern Costa Rica and part of the Isthmus of Panama; so called by its discoverer, Columbus, probably from an Indian village. Later the dukedom of Veragua was created for the heirs of Columbus (see COLUMBUS, Luís), and they still hold the title. At first they had a grant of land in this region, and some attempts were made to found settlements. The grant was eventually given up. During the colonial period Veragua or Veraguas corresponded to the western part of the isthmus, and was attached to New Granada. H. H. S.

Verandrye, PIERRE GAUTIER DE VARENNES, de la: explorer; b. at Three Rivers, Lower Canada, Nov. 17, 1685; entered the French army and served in the war against Great Britain. He subsequently returned to Canada; in 1731, with an escort of fifty men, crossed Lac de la Pluie, W. of Lake Superior, and built Fort St. Peter; in 1732 built Fort St. Charles on the west shore of the Lake of the Woods; in 1733 passed down the Winnipeg river to Winnipeg Lake, and built Fort de la Reine upon the site of Portage la Prairie. Subsequently he and his sons continued their explorations W. until they reached the Rocky Mountains. In 1736 one of his sons, a Jesuit priest, and twenty others were massacred by Sioux on an island in the Lake of the Woods. He ascended the Saskatchewan river to the Forks in 1749 and erected Fort Dauphin there. D. in Quebec, Dec. 6, 1749. The King of France conferred on him the Cross of St. Louis. NEIL MACDONALD.

Vera Paz: See COBAN.

Vera'trine: a mixture of alkaloids used in medicine. It is obtained from cevadilla-seeds (fruit of *Asagræa officinalis* and *Veratrum sabadilla*). Pure veratrine occurs in commerce as a white powder, but can also be obtained in rhombic crystals. It has no smell, but has a bitter, acrid taste, and is very irritating to both tongue and nostrils. It is scarcely soluble in water, but dissolves in alcohol and ether. Upon the animal system veratrine acts as an intense local irritant, and if taken internally produces also the same peculiar constitutional effects as *Veratrum viride*. Veratrine is too irritating to warrant its use as an internal medicine, but is considerably employed externally as a local application for the relief of neuralgias. For such use it is made into an ointment with a convenient vehicle. See ASAGRÆA and VERATRUM. Revised by H. A. HARE.

Vera'trum [Mod. Lat., from Lat. *vera'trum*, hellebore]: a genus of plants of the family *Liliaceæ*. *Veratrum viride*, or American hellebore, called also Indian poke, poke-root, swamp-hellebore, is indigenous in the U. S., growing in damp soil from Canada to the Carolinas. It is an herbaceous perennial, with a thick fleshy root-stock, from which rises a round, solid stem, from 3 to 6 feet high, bearing bright, green leaves, larger below than above, and surmounted by a panicle of greenish-yellow flowers. The root-stock is used in medicine, its activity residing in two alkaloids, *jervine* and *veratroidine*. It is a powerful drug, lowering the force and frequency of the heart-beats and respirations, and having a strong tendency to produce severe nausea and vomiting, with great muscular weakness and relaxation. In overdose it produces alarming prostration and feebleness of the heart, but from the prompt vomiting which large doses occasion, cases of fatal poisoning are exceedingly rare. There is no antidote to the poison, and after evacuation of the dose from the stomach, perfect rest on the back and the use of restorative means, such as alcoholics, ammonia, artificial respiration, etc., constitute the treatment. As a medicine, *Veratrum viride* is used to reduce the force and frequency of the pulse where the same is much above the normal standard, but like all remedies of its class its use requires caution. *Veratrum album*, white hellebore, is a native of Europe and Asia, and is closely allied to the foregoing in botanical characters. The root-stock contains the alkaloid jervine, like *Veratrum viride*, and has been commonly supposed to yield also the alkaloid *veratrine*, found in cevadilla-seeds, but recent analyses make this doubtful. White hellebore affects the animal system much in the same manner as *Veratrum viride*, but is more violent and locally irritating, producing in overdose, in addition to the symptoms already described, severe pain in the abdomen, and even gastro-intestinal inflammation. On account of these properties, white-hellebore root is now almost wholly obsolete as a medicine with American physicians. *Veratrum sabadilla* is a native of Mexico, and is said to be a source of cebadilla-seeds.
Revised by H. A. HARE.

Verazzano, or **Verrazano**, vār-răăt-saa'nō, GIOVANNI, da: navigator; b. near Florence about 1480, of a noble family settled in Val di Greve. It is said that he traveled in Egypt and Syria, engaged in traffic in spices, silks, and other Oriental productions, and entered the French maritime service about 1505; made a voyage to the East Indies in 1517 in a Portuguese vessel; became an expert navigator; was employed as a corsair or privateer by the French Government in 1521 and the following years; took many prizes of Spanish vessels returning from the West Indies, and captured in 1523 the treasure-ship in which Cortés had sent from Mexico to Charles V. a large portion of the personal spoils of Montezuma, valued at $1,500,000. He sailed from the Madeira islands Jan. 17, 1524, on a voyage of exploration to North America; discovered land at a point near Cape Fear; coasted thence northward, discovering a bay, either that of New York or Narragansett Bay; proceeded thence 150 leagues N. E. to lat. 50° N.; returned thence to France, and addressed a letter to King Francis I. from Dieppe July 8

(o. s.), 1524, claiming to have discovered 700 leagues of coast, of which he gave a confused description. Of his later history it is only known that he communicated to persons in England a map of his alleged discoveries, and signed in 1526, with Admiral Philippe Chabot, Jean Ango, merchant of Dieppe, and other partners, an agreement to undertake a voyage to the Indies for spices, with which was combined the purpose of capturing Spanish merchantmen. This voyage seems, however, to have been interrupted by his capture on the southern coast of Spain, and he was executed as a pirate at the village of Pico, near Colmenar de Arenas, New Castile, in Nov., 1527. His exploits as a corsair, his capture and execution are narrated by Pietro Martire d'Anghiera, Bernal Diaz, and other Spanish chroniclers, who call him Juan Florin or Florentin, and it was not till the eighteenth century that this corsair was identified with the navigator by Barcia. No evidence concerning his discoveries has been found in the French archives, and they rest entirely upon the letter mentioned above, which was published at Venice, in an Italian version, by Ramusio, in 1556, no French original being known. In 1835 George W. Greene discovered in the Strozzi Library, at Florence, a MS. copy of this letter, varying somewhat in text from the Ramusio version, and containing some additional paragraphs. This was published, with a translation, in the *Collections* of the New York Historical Society in 1841. In 1864 the genuineness of this letter was attacked in a paper read before that society, and subsequently in other monographs. The letter, however, found an able defender in J. Carson Brevoort, who published an elaborate memoir entitled *Verrazano the Navigator* (1874), giving an account of a planisphere of the supposed date of 1529, found at Rome, signed by Hieronimo Verrazano, and containing a map of the coast discovered by Giovanni. Henry C. Murphy, in his *Voyage of Verrazzano* (1875), has impugned the authority of this map, which he considers based upon the discoveries of Estevan Gomez in 1525. A document discovered at Rouen in 1876 proves that the navigator had a brother Hieronimo (Jerasme de Varasenne), to whom he executed a power of attorney May 11, 1526. The account of the voyage published by Ramusio, whether true or fictitious, may probably be traced to the efforts of this Hieronimo to popularize in Italy his brother's fame as a discoverer; and to him may be ascribed the statement given by Ramusio, that Verazzano was killed by savages during another voyage to America.

Revised by M. W. Harrington.

Verb [viâ Fr. from Lat. *verbum*, word, verb, used to translate the Greek technical term for verb, ῥῆμα] : that part of speech which commonly serves to denote the nucleus of what is stated about the subject.

Distinction between Noun and Verb.—The verb names a phenomenon temporarily exhibited in the subject. The noun is the substratum or substantial framework on which the phenomenon expressed by the verb is exhibited. Thus in *the tree grows*, the phenomenon of growth is displayed in the case of the tree. Other nouns set about the verb help to make more precise the exhibition of the phenomenon or temporary attribute. Thus in *John strikes the dog with a stick*, the phenomenon of *striking*, which for the time makes *John* a *striking John*, is more definitely set forth by the naming of other objects concerned in enacting it. Both nouns and verbs are names, and both may be names of actions, but nouns are names of things in and through which the state expressed in the verb is set forth or exhibited.

Impersonal Verbs.—The impersonal verb offers an apparent exception; *it rains*, *pluit*, ὕει, etc. These are cases where the verb contains in itself a sufficient suggestion of the thing in which the action is exhibited, so that the name thereof is suppressed. It is not "understood." It is latent in the verb. The verb, e. g. *pluit*, embodies the undifferentiated noun and verb.

Transitive and Intransitive Verbs.—A transitive verb is one which commonly requires the addition of an object-noun as complement in order to fully set forth the action it expresses; thus in *he fells a tree*, *fells* is transitive; in *the tree falls*, *falls* is intransitive. A verb commonly transitive may often be used in a sense which makes the verb complete in itself; thus in *she writes a letter*, *writes* is transitive, but in *she writes for a living* the object is implicit in the verb just as much as the subject is implicit in an impersonal verb. An object which is naturally left implicit in a verb may for purposes of emphasis or special effect be formally expressed, in which case it is called a cognate accusative; thus in *to dream a dream*, *to swear an oath*, *to fight a battle*.

Connective Verbs.—Some verbs merely serve formally to introduce the real predication, and are only in that sense the nucleus of what is stated about the subject. Such a verb is the copula *am*, *is*, which is little more than a connective; cf. *John is lame*, *he is eating*, *he is mayor*, *he becomes mayor*, *he turns traitor*, *he grows tall*, *he grows old*. In each of these cases the two last words together express a verbal idea. The expression *father grows old* is, e. g., in Latin, *pater senescit*. The copula or other "link-verb" serves merely the purpose of throwing the substance of the verb into relief by isolation; cf. Gr. ἐστὶν ἔχων = ἔχει.

Compound Verbs.—It is often necessary to add to a verb a defining word in order to express the exact sense in which it admits a complimenting object. These are called compound verbs; cf. Lat. *consiliis obstare*, *Cæsar omnem agrum Picenum percurrit*. In the latter example *agrum* is adjusted to its office as complement of *currere* only by aid of *per-*; *percurrit* is rendered in English by the transitive verb *traversed*. In *he laughed at it*, *what are you laughing at?* the verb *laugh-at* is a compound verb in the same sense as *percurrit*, and may be inflected in the passive voice, *it was laughed at*. In *he laughed at it* the thing which is predicated of *he* is *at-laughing*. Adverbial elements thus used are called, in deference to their appearance as prefixes in, e. g., the classical languages, preverbs. Through continual use with different verbs a preverb tends to detach itself from the verb and develop a closer connection with the nouns it introduces. It is then called a preposition. It is not always easy to draw the line absolutely between preverbs and prepositions.

Voice.—Most languages possess devices for expressing with some added precision the relation which the action set forth through the subject bears to that subject. This differentiation in the aspect of the verb is called *voice* (Gr. διάθεσις, Lat. *genus*). The assertion of a *man-washing*—i. e. of the act of washing displayed in the case of a man—may mean (1) that the man does the washing, either without further information concerning the object, leaving that to inference or passing it as not involved in the matter to be stated, as in *the man washes*—i. e. *is a washer*—or with statement of the object, as in *the man washes the door*; this is called the active voice. (2) That the man is himself the object or beneficiary of the washing—i. e. that the act completes itself upon the subject or within the sphere of the subject, as in *the man washes* in the sense of *takes a bath*. Thus Gr. λούω τοὺς πόδας (active), I wash the feet (of some one else), but λούομαι τοὺς πόδας (middle), I wash my feet, λούομαι, I take a bath; this is called the middle voice. (3) That the man is the object upon which the action of washing completes or satisfies itself, as in *the man is washed*, the subject being left unstated. If it is necessary to state it, a phrase is added, as *the man is washed by somebody*. This is called the passive voice, and is a linguistic device for avoiding the necessity of stating the subject or for throwing the object of the action into prominence by making it the subject of the sentence.

Mood.—The mood of a verb concerns the attitude or tone of the assertion. The predicate may be asserted of the subject in various attitudes or moods; thus it may be asserted as a reality or as a conception of the mind—that is, as an idea. As a conception of the mind, it may be surmised, believed (as an opinion), willed, promised, wished, demanded. The indicative is the mood which presents the assertion in the guise of reality; it introduces the assertion as a reality. The term subjunctive is variously applied. In the strictest sense and as used in comparative syntax the subjunctive is the mood of the *willed* idea—i. e. it involves assurance, promise, and a consciousness of personal control, which is not present in the mere desire of the optative mood. The term subjunctive is used in a much wider sense in Latin grammar. Here it designates a class of grammatical forms in which the subjunctive and optative uses have nearly blended. It is therefore in Latin the mood of the non-real. It introduces the assertion as a conception of the mind. The optative mood represents the predicate as a desire. The imperative asserts a demand. It demands that the predicate be true of the subject.

Tense.—The tense of a verb concerns the relation of the verbal action to the matter of time. Tense may express (1) the date of action—i. e. its location in time; hence tenses are either past, present, or future. (2) The duration of the action; thus tenses may indicate an action as having continu-

ance either in past, present, or future, as being completed in past, present, or future, or as simply occurring in past, present, or future without reference either to continuance or completion. The inflectional languages have generally an insufficient supply of forms to serve for all these categories; hence two or more are frequently quartered upon a single form. Thus the Latin perfect may express either completion in the present or occurrence in the past.

BENJ. IDE WHEELER.

Verbeck, GUIDO FRIDOLIN, D. D.: missionary, and one of the organizers of the national system of education now in use in Japan; b. at Zeist, Holland, Feb. 1, 1830; educated in the Moravian Academy at Zeist, and the Theological Seminary in Auburn, N. Y. (1859); followed mechanical engineering in Wisconsin and Arkansas 1852–56; missionary in Japan of the Reformed Church in America from 1859. In 1863 he entered upon educational work for the Japanese Government, and from 1869 to 1873 was superintendent of teachers and instruction in the foreign department of the Imperial University at Tokio. Thereafter, and almost until he resumed his missionary work in 1879, he was engaged in translation work and organizing work for the Government. In 1891 he became a teacher of theology in the *Meiji Gakuin*, but still carried on his other missionary labors and his work as one of the translators of the Old Testament and as a member of the New Testament revision committee. Between 1873 and 1878 he made, in connection with Japanese scholars, many translations for the Government. Among these *The Code Napoleon*; Bluntschli's *Staatsrecht*; *Two Thousand Legal Maxims*, with comments; with forest laws, and constitutions of various European countries. In addition to many memorials and pamphlets, he published a *History of Protestant Missions in Japan* (1883). In 1877 he received the third-class decoration of the Rising Sun. D. in Tokio, Mar. 9, 1898. WILLIS J. BEECHER.

Verbeek, REINIER DIRK M.: mining engineer; b. at Maarsen, Holland, Sept. 5, 1841; educated at the University of Liège, Belgium, and at the mining academies of Clausthal, Hanover, and Freiberg, Saxony; took his degree at Freiberg 1864; has lived for many years in the Dutch East Indies; became superintendent of the Geological Survey of Sumatra 1875; has published papers on the mining laws of the Netherlands, on the mineral resources of the East Indian Archipelago, on the eruption of Krakatoa, and on various geological subjects.

Verbe'na Family [*verbena* is Mod. Lat. (with meaning from Eng. *vervain* and Fr. *verveine*), from Lat. *verbe'na*, foliage, herbage, sacred boughs, (also) a class of plants used in medicine as cooling remedies]: the *Verbenaceæ*, or Vervain family; a group of 740 species of gamopetalous, dicotyledonous herbs, shrubs, and trees mainly of the tropics and south temperate zone. The corolla is more or less two-lipped or irregular; the stamens four or two; the ovary superior, four-carpellary, not lobed, and few-ovuled; style terminal. The plants of this family are nearly related to the mints (*Labiateæ*), with which they agree in their opposite leaves and in most of their floral characters, but they usually lack an aromatic foliage. About forty species are natives of North America, nearly one-half of which belong to *Verbena*. South American species of verbena are well-known ornamental plants, as are also the lemon verbena (*Lippia citroidora*) from Chili, *Lantana*, *Clerodendron*, and others. The teak-tree of India is the *Tectona grandis*. Species of *Vitex* in New Zealand are large and valuable timber trees. Some of the wild species of verbena are somewhat used as domestic medicines under the name of *Vervain*. CHARLES E. BESSEY.

Verboeckhoven, ver-book'hō-ven, EUGÈNE JOSEPH: animal-painter; b. at Warneton, West Flanders, June 9, 1799; pupil of his father, Barthélemi Verboeckhoven; member of Brussels, St. Petersburg, Antwerp, Amsterdam, and Ghent Academies, the Legion of Honor, and Order of the Iron Cross, and commander in the Orders of Leopold of Belgium and Francis Joseph of Austria. D. in Brussels, Jan. 19, 1881. His pictures of sheep are widely known, and he enjoyed a great reputation in his lifetime. Pictures by him are in the National Gallery, Berlin, the Städel Gallery, Frankfort, and in the museums at Brussels, Leipzig, Ghent, Königsberg, Amsterdam, New York, and Hamburg. W. A. C.

Vercelli, vär-chel'lĕe (anc. *Vercellæ*): capital of a district in the Piedmontese province of Novara, Italy; near the right bank of the Sesia; in a marshy, unhealthful plain (see map of Italy, ref. 3–B). Its manufacturing industries, especially silk-spinning, and its commerce are thriving; the district produces rice, hemp, flax, silk. The town is the center of an extensive railway system, and has a large market-place with a statue of Cavour (erected 1864), fourteen churches, several of which, as well as the Galleria dell' Instituto di Belle Arti, contain fine frescoes by Gaudentio Ferrari, one of the foremost painters of the Vercelli school (fifteenth and sixteenth centuries). The magnificent cathedral, dating from the sixteenth century, contains an excellent library with ancient and valuable MSS., including the *Codex Vercellensis*, one of the most important MSS. of the old Latin version of the Gospels, written by Eusebius, Bishop of Vercelli in the fourth century A. D., and the *Vercelli Book*, an invaluable collection of the remains of Anglo-Saxon literature. There are in Vercelli a lyceum, a gymnasium, a technical school, a theological seminary, two hospitals, an orphan asylum, and a theater. Pop. 29,244 (commune). The town was the capital of the Libici in Gallia Transpadana; later a fortified *municipium* of the Romans. A little S. E. from it, on the Raudian fields (*Campi Raudii*), Hannibal won his first victory on Italian soil in 218 B. C., and Marius routed the terrible Cimbri in 101 B. C. The city became a possession of the house of Savoy in 1429.

HERMANN SCHOENFELD.

Verd Antique, or **Verde Antico** [*verd antique* is from Fr. *vert antique*, liter., antique green; *vert*, green + *antique*, ancient]: a fine green stone mottled with white and brown; greatly esteemed for decorative work. It is a kind of serpentine. Five specimens of it have been found among the ruins of Roman buildings, or have been taken from their walls to be used in modern structures. Green marbles and other stones of good green color and taking a polish have been called by this name. A stone quarried at Roxbury, Vt., and a marble at Milford, Pa., are both sold as verd antique. R. S.

Verde, Cape: See CAPE VERDE.

Verden, fär'den. ancient fortified place, now a town; province of Hanover, Prussia; on the Aller, near its influx in the Weser (see map of German Empire, ref. 3–E). It has a fine cathedral, large breweries, tobacco manufactures, and valuable fisheries. Pop. (1890) 8,719.

Verdi, GIUSEPPE: composer; b. at Roncole, in the duchy of Parma, Italy, Oct. 9, 1813; received his first lessons in music from the organist of the village church; attracted the attention of an amateur musician, who sent him to Milan, where, from 1833 to 1836, he studied under Lavigna, head of the Scala theater. Verdi's first opera was *Oberto, conte di San Bonifazio*, produced in Milan Nov. 17, 1839. He afterward composed about twenty-six operas, the best known of which are *Il Trovatore*, *La Traviata*, *Rigoletto*, *Ballo in Maschera*, *Aida*, *Otello*, and *Falstaff* (1893). One large work for the Church should also be mentioned—namely, a *Grand Requiem Mass*. A large number of his works have been received with enthusiasm in all civilized lands. An additional proof of his talent was the fact that the quality of his work did not fall off during the long period of his professional activity, but kept pace with the great changes that affected the dramatic stage. D. in Milan, Jan. 27, 1901.

DUDLEY BUCK.

Verdict [(with *c* restored from Lat.) from O. Fr. *verdit* < Late Lat. *verdic'tum*, *veredic'tum*; *vere*, truly + *dictum*, said, neut. perf. partic. of *di'cere*, *dic'tum*, say]: in law, the decision rendered by a jury according to law, as to the matters in issue submitted to them, in respect of which they have been sworn to find and declare the truth.

The jury, after the proofs are summed up, may render their verdict, and if they desire may withdraw from the court to consider it. The jury while considering the verdict are laid under severe restrictions as to secrecy, communication with third parties, etc., and a certain amount of pressure may be brought to bear upon them by keeping them confined in order to make them agree upon a verdict. These restrictions are now less severe than they were formerly, the law having been that they should be kept confined by themselves, and should not eat or drink except by the consent of the court till they had rendered a verdict, and that if they had not agreed upon a verdict at the time when the judge was about to leave for another place on his circuit he could carry them about with him in a cart. At present it is the custom to keep the jury together a reasonable length of time, and then, upon their failure to agree, either to

discharge them with or without the consent of the parties, or to allow a juror to be withdrawn by the consent of the parties, so that no verdict can be rendered.

When the jury have agreed upon a verdict they must, in general, deliver it in open court in the presence of the plaintiff or his representative. In common-law procedure, if the plaintiff is not present in person or by attorney no verdict is rendered, but he is non-suited; but this matter is now frequently regulated by statute. If the plaintiff appears, the jury by their foreman deliver their verdict, declaring that they find "for the plaintiff" or "for the defendant," as the case may be, and if for the plaintiff in certain actions at the same time assessing the amount of damages sustained by him by reason of the injury alleged in his complaint. In a criminal case the verdict is generally either "guilty" or "not guilty."

A verdict is *general* when by it the jury render a complete decision on the facts presented in connection with the law applicable to them, as laid down by the court in the charge. In some cases, as when the application of the law to the facts is so difficult that it is advisable to leave this to the court, the jury may be instructed to bring in a *special* verdict, which is one in which the jury simply find the facts, setting them forth in a detailed manner and form, but do not apply the law to them so as to render a final decision in favor of either party. In Scotland a form of special verdict in criminal cases is that of "not proven," which does not acquit the prisoner, but does protect him from a second trial for the same offense.

A verdict to be valid must be unanimous, and as a general rule must be received by at least one of the judges before whom the action was tried, and be returned before the end of the trial term at which the action was tried. The weight of modern authority is that the verdict may be returned and received by the court on Sunday.

If the jury agree upon their verdict after the adjournment of the court for the day, they are permitted to reduce it to writing, sign, and seal it up, and then separate; or they may be directed by the court to render a sealed verdict. In such case they must be present at the reassembling of the court, when their sealed verdict will be opened and announced. After a verdict of guilty in criminal prosecutions, the jury may be "polled" by the prisoner—that is, each juryman may be asked by name if the verdict thus announced is his verdict; and this privilege is given by statute in civil actions in many instances to the losing party.

See Stephen's *Commentaries on the Law of England*; the treatises of Stephen, Gould, and Archbold on *Pleading* and *Practice*; Macdonald's *Treatise on the Criminal Law of Scotland*. F. STURGES ALLEN.

Ver'digris: See ACETATE.

Verdon, Sir GEORGE FREDERIC, K. C. M. G., C. B., F. R. S.: b. in Lancashire, England, Jan. 21, 1834; educated at Rossall College, Lancashire; went to Melbourne, Australia, 1851; engaged in business; was called to the bar of Melbourne 1853; became chairman of the municipal council of Williamstown; led a volunteer company in the suppression of the outbreak of convicts 1857; elected member for Williamstown 1859; minister of the crown 1860–68; went to Great Britain in 1866 as a representative of the Government and Legislature of Victoria to urge upon the home Government the defense of the colony; soon after was appointed permanent agent-general of Victoria in Great Britain, but resigned in 1872; represented the British Royal Commission of the International Centennial Commission held at Melbourne 1888–89; aided in establishing and equipping the observatory at Melbourne. D. Sept. 13, 1896.

Verdun, vär'dŭn' (anc. *Verodunum*): town: department of Meuse, France; on the Meuse; 35 miles by rail W. of Metz (see map of France, ref. 3–H). It is one of the numerous minor fortresses of the old system, the see of a bishop, the seat of a court of first resort, and of an ecclesiastical seminary. There are manufactures of iron, leather, beer, liquors, and sweetmeats. Pop. (1896) 22,151. In 843 an important treaty was made here between the Emperor Lothaire and his brother Ludwig the German. (See TREATIES.) During the Franco-German war Verdun resisted a *coup-de-main* (Aug. 24, 1870) and an investment and bombardment, surrendering Nov. 8, 1870. Subsequently it was the last place held by the Germans and was given up in Sept., 1873.

Vere, Sir AUBREY HUNT, de: b. at Curragh Chase, County Limerick, Ireland, Aug. 20, 1788; son and heir of Sir Vere Hunt, first baronet, to whose title he succeeded 1818, and subsequently took the name De Vere. He was an enthusiastic disciple of Coleridge. He was the author of two dramatic poems, *Julian the Apostate* (1822) and *The Duke of Mercia* (1823), and *A Song of Faith, Devout Exercises, and Sonnets* (1842). D. July 5, 1846. His works have frequently been ascribed to his son, AUBREY THOMAS DE VERE (*q. v.*), and *vice versa*. Revised by H. A. BEERS.

Vere, AUBREY THOMAS, de: author; son of Sir Aubrey Hunt de Vere; b. at Curragh Chase, Ireland, Jan. 10, 1814; educated in Trinity College, Dublin. He became a Roman Catholic in 1851 and much of his poetry is religious in character. He was an intimate friend and connection by marriage of Sir Henry Taylor; has published *The Waldenses* (1842); *The Search after Proserpine, and other Poems* (1843); *English Misrule and Irish Misdeeds* (1848); *Picturesque Sketches of Greece and Turkey* (2 vols., 1850); *Poems, Miscellaneous and Sacred* (1856); *May Carols* (1857); *The Sisters, etc.* (1861); *The Infant Bridal, etc.* (1864); *The Church Settlement of Ireland, or Hibernia Pacanda* (1866); *Irish Church Property, and the Right Use of it* (1867); *Pleas for Secularization* (1867); *Irish Odes, and other Poems* (1869); *The Legends of St. Patrick* (1872); *Alexander the Great, a Dramatic Poem* (1874); a poem on the centenary of Daniel O'Connell (1875); *Saint Thomas of Canterbury* (1876); *Antar and Zara* (1877); *Legends of the Saxon Saints* (1879); *The Foray of Queen Meane* (1882); *Poetical Works* (1884); *Ireland and Proportional Representation* (1885); *Essays chiefly on Poetry* (1887); *Essays chiefly Literary and Ethical* (1889); *Religious Poems of the Nineteenth Century* (1893). Revised by H. A. BEERS.

Vere, EDWARD, de: seventeenth Earl of Oxford; b. in England about 1540; educated in St. John's College, Cambridge; was in high repute as a wit and a poet at the court of Queen Elizabeth, and was famous for the prodigality of his living; had an encounter, not much to his credit, with Sir Philip Sydney; married Anne, the eldest daughter of William Cecil, Lord Burleigh; is alleged to have treated her inhumanly to revenge himself upon Burleigh for not interfering to save the life of his relative, Thomas Howard, Duke of Norfolk (beheaded for treason 1572); was made lord high chamberlain, and in that capacity sat on the trials of Mary Queen of Scots (1586) and the Earls of Arundel (1589), Essex, and Southampton (1601), and held a command in the fleet sent against the Spanish Armada (1588). He wrote a number of comedies, not extant, and contributed poems to Richard Edwards's *Paradise of Daynty Devises* (1576) and other collections of that period. D. in London in July, 1604. His wife (d. June 6, 1588) also wrote verses, some of which are in John Southern's *Pandora* (1584). Revised by H. A. BEERS.

Vere, Sir FRANCIS: soldier; b. in England about 1560 (some authorities say 1554); grandson of John de Vere, fifteenth Earl of Oxford; served in the army in the Netherlands under the Earl of Leicester 1585, and subsequently under Lord Willoughby; was knighted for gallantry at the defense of Bergen-op-Zoom 1588; relieved the garrison at Berg on the Rhine 1589; contributed to the capture of Zutphen; was instrumental in the retaking of Deventer and in the defeat of the Prince of Parma near Nymwegen 1591; was lord-marshal in the expedition against Cadiz 1596; distinguished himself at Turnhout, and became governor of Brill 1597; was recalled to England during the threatened Spanish invasion 1599; was severely wounded at Nieuport, where he determined the victory for Prince Maurice, July 5, 1600, and successfully defended Ostend against great odds 1601–02. D. in London, England, Aug. 28, 1608, and was buried in Westminster Abbey. His *Commentaries*, narrating his services in the Netherlands, were published in 1657. —His younger brother, HORATIO, b. at Kirby Hall, Essex, in 1565, distinguished himself under his brother's command in the Netherlands, and commanded the English auxiliaries in Germany 1620–23; was created Baron Vere of Tilbury July 25, 1625, and became master of the ordnance 1619. D. in London, May 2, 1635. See Markham, *The Fighting Veres* (1888). Revised by F. M. COLBY.

Vere, MAXIMILIAN, Freiherr von SCHELE de: scholar; b. near Wexiö, Sweden, Nov. 1, 1820; was educated in Germany and served in the Prussian military and diplomatic service; removed to the U. S. in 1842; Professor of Modern Languages in the University of Virginia 1844–61; entered the Confederate service as a captain; subsequently was appointed commissioner to Germany to further the cause of

the Confederate States; lived in Europe for several years studying literature and social questions; resumed his professorship after the war; has translated works from the French and German, and has written a number of books, including *Outlines of Comparative Philology* (New York, 1853); *Grammar of the Spanish Language* (1854); *Stray Leaves from the Book of Nature* (1856); *Romance of American History* (1872); *Americanisms* (1873); and *Modern Magic* (1874).

Verestcha'gin, VASILIĬ: genre and military painter; b. at Tcherepovets, Russia, Oct. 26 (N. S.), 1842; studied at St. Petersburg Academy and under Gérôme in Paris; has traveled much in the East, and painted pictures and studies in India and Turkestan. He served with the Russian army in Turkestan and during the Russo-Turkish war, and was severely wounded; painted a series of pictures representing battles and episodes of that campaign. His works, many of which are of immense size, have been called realistic by some critics, and by the exhibition of his pictures in a complete collection in the principal cities of Europe and in the U. S. his name has become widely known. WILLIAM A. COFFIN.

Verga, vär'gäa, GIOVANNI: novelist; b. at Catania, Sicily, in 1840. Much of his life has been spent at Florence and Milan. He began his literary career with two stories, which he has since repudiated, calling them the "two sins of his youth," *Il Carbonari della Montagna* (1865) and *Storia di una peccatrice* (1865). He first showed real power in the *Storia di una capinera* (1869), a romance in epistolary form, containing much delicate psychologic observation. He did not, however, at once follow the vein he had struck in this book, but in a series of romances of Italian high life allowed himself to be influenced by the French sensational novel. To this period belong *Eva* (5th ed. 1880); *Nedda* (1874); *Eros* (1875); *Tigre reale* (1875); *Primavera* (with other stories, 1877). Gradually, however, the influence of the naturalistic movement in fiction, as well as his own proper aptitudes, led him to seek artistic success less from ingenious plots and sensational situations than from a rendering in exact and adequate terms of such life as he had actually seen and known. The volume of short tales, *La vita dei campi* (1880), takes the reader among the peasants of Sicily, and gives him glimpses of their narrow yet passionate existence, their fierce loves and yet fiercer hates; in short, the humble but often terrible tragedy of their lives. Among these tales is that entitled *Cavalleria rusticana*, used by the composer Mascagni as the basis of his now famous opera. Since the appearance of this collection, Verga has published a long series of romances and collections of tales: *I Malavoglia* (1881); *Il marito di Elena* (1882); *Il come, il quando ed il perchè* (1882); *Pane nero* (1882); *Novelle rusticane* (1883); *Per le vie* (1883); *Vagabondaggio* (1887); *Maestro Don Gesualdo* (1889); *I ricordi del capitano d'Arce* (1892); *Cavalleria rusticana ed altre novelle* (*Vita dei campi*, 6th ed. 1892); *Don Candeloro e C.* (1893).

A. R. MARSH.

Vergennes, ver-genz': city; Addison co., Vt.; on the Otter creek, and the Cent. Vt. Railroad; 7 miles from Lake Champlain, and 33 miles S. W. of Montpelier (for location, see map of Vermont, ref. 5–A). It has regular steamboat communication with the lake ports during the summer; has good water-power from a creek which here falls over 30 feet; and contains the State Reform School, graded public school, parochial school, public library, 5 churches, 2 national banks with combined capital of $225,000, and a weekly paper. It is noted as the building-place of the fleet with which Capt. MacDonough captured a British squadron off Plattsburg Sept. 11, 1814. Pop. (1890) 1,773; (1900) 1,753.

Vergennes, vär'zhen', CHARLES GRAVIER, Comte de: statesman; b. at Dijon, department of Côte-d'Or, France, Dec. 28, 1717; entered very early on a diplomatic career; was minister at Treves 1750–55, at Constantinople till 1768, at Stockholm 1771, and became Minister of Foreign Affairs in 1774. He concluded the treaty of alliance with the Swiss cantons in 1777, and with the American colonies in 1778, to which he was very friendly, and negotiated the Peace of Teschen (May 13, 1779), which ended the war of the Bavarian succession, and the Peace of Versailles (Sept. 3, 1783). He was an adroit negotiator, but a mediocre statesman, and his meddling with the finances became fatal to France; he drove Necker out and brought Calonne in. D. at Versailles, Feb. 13, 1787.

Vergier de Hauranne: See DUVERGIER DE HAURANNE.

Vergil (full Latin name, *Publius Vergilius Maro*; the spelling *Virgil*, Lat. *Virgi'lius*, arose in the Middle Ages by popular etymological connection with Lat. *vir'ga*, rod, magician's wand, Vergil being regarded as a magician): the most celebrated Latin poet; b. at Andes, near Mantua, Oct. 15, B. C. 70. His parents lived in humble circumstances, but he received a careful education. His paternal estate was assigned (B. C. 41 and 40) to the veterans of Octavianus, but his application to the emperor effected a restoration of his lands or an indemnification for them. From this time Vergil lived partly in Rome, partly at Naples, always suffering from delicate health, but in the possession of sufficient means. He was himself a gentle and amiable character, and as a poet most successful in subjects which admit of genial treatment, as inanimate nature, one's native country, family ties, and love, but he allowed himself to be led on to subjects too grand for him; for, though pleasing in his episodes, he was hardly equal to majestic occasions. He collected his materials with great diligence, and polished his verse with extreme care; and this faithful labor won for him that elegance in style and correctness in meter which made him the standard of classicality in Roman poetry for a long period. Before the lapse of a century Vergil's works were used, as they are to this day, as text-books in schools for learning Latin, and in subsequent times his writings were drawn upon for *centos*, superstition consulted them as an oracle, and upon his name the nations of the West accumulated their fictions and legends in the Middle Ages. During the Renaissance his works exercised a great influence on Italian literature, and partly through that literature, but more by direct study, also on French and on English poets. He died at Brundisium, Sept. 21, B. C. 19, and was buried near Naples, where his tomb is still shown.

Vergil's extant poems are (1) *Eclogæ*, ten bucolics, written B. C. 41–39, imitations, and to some extent translations, of Theocritus, but with an admixture of persons and events of his own time and country. Though Vergil can hardly be said to have improved on his original, yet these have always been regarded as very graceful and pleasing compositions, and themselves inspired one of the most brilliant and charming works of Pope, his *Pastorals*. (2) *Georgica*, in four books, composed B. C. 37–30, the first on agriculture, the second on the culture of trees, the third on domestic animals, and the fourth on bees. The prostrate condition of husbandry at the end of the civil wars induced Mæcenas, the influential favorite of Augustus, to propose husbandry to Vergil as the subject of a didactic poem. The task suited the taste of the poet, and he devoted himself to it with earnestness and enthusiasm. So successful was this attempt that in the *Georgics* we have confessedly the most perfect production of Roman art in this kind. In handling this theme Vergil could avail himself of his own personal experience in youth, but his studious bent would incline him also to consult and appropriate the works of others on this subject, which abounded in Greek and Latin, as of Hesiod, Aratus, Nicander, and Xenophon, of Cato, Mago, and Varro. (3) *Æneis*, in twelve books, begun about B. C. 29, but not finished when the poet died (B. C. 19), yet made public by his executors, L. Varius and Tucca, contrary to the express desire of the author. The *Æneid* turns on the fate of Æneas, the founder of a second Ilium and indirectly of Rome, and the ancestor of the Julian family. In this work Vergil in part had recourse to Greek sources and models, and in part relied on his own extensive study of Italian legends, history, and localities, thus blending Hellenic and Latin elements. According to Donatus (*Vit.* 46), Vergil read to Augustus books ii., iv., and vi., which, in the judgment of posterity, are, the first two the most real, and the last the most curious and interesting of all. The style of the *Æneid* in general is rather somber and unnatural, but always dignified; and we can not but feel the fascination of its graceful and sonorous lines. Indeed, whatever faults criticism may have pointed out in this work, it has secured to its author an undisputed place among the few great epic poets the world has yet seen. Vergil derived from the Homeric poems the plan and style of the *Æneid*, as well as numerous details. Book vi. is quite in the manner of *Odyssey* xi., and the first half of the *Æneid* may be said to be in imitation of the *Odyssey*, as the rest is of the *Iliad*; the subject of book ii. is drawn from the Cyclic poets, and book iv. is imitated from Apollonius Rhodius. Of the Roman poets, Vergil has chiefly imitated Ennius (see, e. g., vi., 846), as Servius and Macro-

bius remark. Aulus Gellius (i., 21) says: *Non verba sola, sed versus prope totos et locos quoque Lucreti plurimos sectatum esse Vergilium*; and Vergil himself in turn has been copied more or less by all the Latin epic and didactic poets, as Persius, Silius Italicus, Valerius Flaccus, Statius, Ausonius, and Prudentius.

Besides these great and genuine works of Vergil, certain minor poems have come down to us under his name: (1) *Culex*, a description of Hades. It is certain that Vergil in his youth wrote a brief epic of this name, but the general character of the poem which we have, especially its frequent imitations of the writings of Vergil, chiefly of the vi. *Ecl.* and the vi. *Æn.*, renders it probable that a new work, composed, however, soon after Vergil's death, occupies the place of the original. The extant poem, though puerile in composition, is masterly in metrical treatment. (2) *Ciris*, an account of the treacherous conduct of the Megarian princess Scylla against her father Nisus, and her transformation into the bird Ciris. This poem seems to have arisen in the circles of Messala, being dedicated to his son, who was consul A. U. C. 751. The author draws largely on Vergil, but also imitates Catullus, and reminds us here and there of Lucretius, Tibullus, and some of the Augustan poets. Metrically, this piece is less correct than Vergil, but in style it is more lively. (3) *Moretum*, a pleasing idyl, believed by Lachmann to belong to the time of Vergil, and perhaps translated by him from a Greek poem of Parthenius. It is vivid in description, amiable in spirit, and elaborate in form. (4) *Copa*, a short elegy of the best period, Vergilian in style, but more sprightly in tone. (5) *Catalepton*, fourteen poems in elegiac and iambic meter on various subjects. Only two are well attested as coming from Vergil, two alone can be proved not to be by him, and they all certainly belong to his period.

Of Vergil's prose, we know only of his correspondence with Augustus, which was probably published by the emperor's order. Seneca the Elder (*Exc. Controv.*, iii., 8) says of it: *Vergilium illa felicitas ingenii in oratione soluta reliquit.* Specimens of it are given in Donati, *Vita Vergiliana*, and in Macrobius, i., 24.

As to the form of his name, the inscriptions of the time of the republic and of the first centuries after Christ are in favor of *Vergilius*, and so the older MSS., as the Medicean. The Greeks also generally wrote Βεργίλιος or Οὐεργίλιος. The earliest dated instances of the form *Virgilius* are of the fifth century. In the Middle Ages, about the ninth century, this form began to be common, and in the fourteenth and fifteenth centuries it prevailed, though the Italian scholar, Angelo Poliziano, proved it to be wrong. Editions by O. Ribbeck (3 vols., Leipzig, 1859–68; new ed. begun in 1895); Conington and Nettleship, with commentary (3 vols., London, 1881–83); text alone, Thilo (Leipzig, 1886). See also Sellar, *The Roman Poets of the Augustan Age: Virgil* (Oxford, 1877); D. Comparetti, *Virgilio nel medio evo* (Livorno, 1872); J. S. Tunison, *Master Virgil, the Author of the Æneid, as he seemed in the Middle Ages* (Cincinnati, 1888).

Revised by M. Warren.

Vergil, Polydore: author; b. at Urbino, Italy, about 1470; became a priest and acquired a considerable literary reputation by his *Proverbiorum Libellus* (1498), several times reprinted in the sixteenth century, and by a treatise on the discovery of arts and sciences, *De Rerum Inventoribus* (1499); was sent by Pope Alexander VI. to England to collect the papal tribute called "Peter's pence" 1501, being the last to hold that office; remained in England for the most of his life; was made rector of Church Langton, Leicestershire, archdeacon of Wells, prebendary of Hereford and of Lincoln, all in 1507; exchanged the latter prebend for one in St. Paul's, London, 1513; was an intimate friend of Erasmus and the great scholars of the time; wrote, besides many miscellaneous treatises, a voluminous Latin history of England, *Historiæ Anglicæ Libri XXXVI* (Basel, folio, 1533; best ed. Leyden, 1651), and edited Gildas's *De Calamitate, Excidio et Conquestu Britanniæ* (1525). He returned to Italy in 1550, and died probably at Urbino about 1555. Two volumes of an old English translation of his *Historiæ* were edited by Sir Henry Ellis for the Camden Society (1844–46), and a translation by John Langley of his *De Rerum Inventoribus* was edited for the Agathynian Club by Dr. William A. Hammond, who prefixed an *Account of the Author and his Works* (New York, 1868).

Revised by A. R. Marsh.

Verginia: a Roman maiden. See Virginia.

Vergniaud, vär'nyi-ō', Pierre Victurnien: revolutionist; b. at Limoges, France, May 31, 1753; studied law in his native city and in Paris, and settled in 1781 as an advocate in Bordeaux. Elected a deputy to the Legislative Assembly of 1791 from the department of Gironde, he became the leader of a great majority, the so-called Girondist party, and on Oct. 31 president of the Assembly. On Mar. 24, 1792, the king dismissed the Girondist ministry, and the negotiations which were carried on between the king and Vergniaud by de Boze and Thierry having failed, on Aug. 10 Vergniaud himself proposed the suspension of the royal power. In the National Convention, which opened on Sept. 21, the Girondists still had the majority, but not the real power. In the trial of the king, Vergniaud supported by a brilliant speech the proposition of an appeal to the people; but when the proposition fell, he voted for the execution without delay (Jan. 30, 1793). In the contest which now took place between the Girondists and the Jacobins, Vergniaud time after time swayed the whole assembly by the force of his eloquence, but he finally broke down before the argument which Marat used—the introduction of a howling, maddened mob into the very hall of the Convention. The Jacobins finally succeeded (June 1) in carrying a decree for the arrest and trial of the Girondists. On Oct. 24 the trial began, and Vergniaud, who for some time had fallen into a kind of mental insensibility, rose once more to the full height of his genius, and terrified the Jacobins by his speeches of defense. The trial was stopped, the sentence pronounced without scrutiny, and Vergniaud was guillotined Oct. 31, 1793. Several of his speeches are found in Barthe's *Les Orateurs français* (4 vols., Paris, 1820), and in *Choix de Rapports, Opinions et Discours* (Paris, 1818–25). See also Touchard-Lafosse, *Histoire parlementaire et Vie intime de Vergniaud* (Paris, 1848); Vatel, *Vergniaud: Manuscrits, Lettres et Papiers* (1875); and Stephens, *The Principal Speeches of the Statesmen and Orators of the French Revolution* (1892).

Revised by F. M. Colby.

Verhas, Jan: genre-painter; b. at Termonde, Belgium, Jan. 9, 1834; pupil of his father, head of the School of Design at Termonde, and of Nicaise de Keyser in Antwerp; studied also in Italy; received a second-class medal at the Paris Salon 1881, and a first-class medal at the Paris Exposition 1889; became member of the Legion of Honor in 1881. A large picture, *Procession of School Children at Brussels*, is in the British Museum. W. A. C.

Veria, or **Kara Feria**: town of European Turkey; in the vilayet of Salonica; the *Berea* of Acts xvii. 10; has many antiquities. The inhabitants manufacture a mixed woolen and linen stuff for bathing-clothes and quarry red marble from Mt. Bermios. Pop. (1889) 5,800. E. A. G.

Verification: (1) in common-law pleading, the statement with which a party alleging new matter is obliged to conclude his averments, to the effect that he stands ready to establish the truth of the matters thus set forth—the ordinary form of this statement is "and this he is ready to verify"; (2) in equity and code pleading, the affidavit which a party is required to annex to a pleading, as an answer, complaint, petition, etc., swearing that the matters alleged are true to the knowledge of the deponent, except where stated to be alleged upon information and belief. Under the code procedures a defendant served with a sworn complaint must serve a sworn answer or suffer judgment to be taken in default of so doing. The verification must generally state the sources of the deponent's information and the grounds of his belief. See Stephen's *Principles of Pleadings in Civil Actions*; Daniell's *Chancery Practice*; and the various codes. F. Sturges Allen.

Ver'juice [from O. Fr. *verjus* < Lat. *viride jūs*, green broth]: the acid or sour juice of unripe grapes, formerly used in Europe as a beverage, especially as an astringent or refrigerant in medicine. The term also includes the fermented juice of crab-apples, which is used as a flavoring agent in cooking, as for sauces, called also agresta and omphacium.

Verkolie, ver-kōl'yĕ, Jan: painter; b. in Amsterdam, Netherlands, Feb. 9, 1650; son of a blacksmith. At the age of ten he injured his foot and was confined to his bed for three years, during which time he copied engravings and prints and thus found out his aptitude for drawing. Shortly after his recovery he entered the school of John Lievens, who found him so skillful that he set him to finish some pictures Gherardt von Zeÿl had left incomplete. Verkolie

afterward painted an original picture that was mistaken for the work of this artist. He married at Delft in 1672 and established himself there, painting portraits for the most part and employing his leisure in painting historic and mythological subjects which he engraved in mezzotint, an art he taught himself. D. at Delft in 1693, leaving two sons. One of these, NICHOLAS (b. at Delft, 1673; d. in Amsterdam, 1746), became a good painter, chiefly of historical subjects, and also was a noted engraver. W. J. STILLMAN.

Verlaine, PAUL: French poet; b. at Metz, Lorraine, Mar. 30, 1844; devoted himself to letters and early distinguished himself among the young poets who, starting from the *Parnassiens*, separated themselves consciously from them in search of novelty of form and profundity of meaning, and have been called *Symbolistes* and *Décadents*. He was regarded by them with great admiration, and exercised a real influence upon French poetry. D. in Paris, Jan. 8, 1896. Among his works are *Poèmes saturniens* (1865); *Fêtes galantes* (1869); *La bonne Chanson* (1870); *Sagesse* (1881); *Jadis et Naguère* (1885); *Romances sans Paroles* (1887); *Amour* (1888); *Parallèlement* (1889); *Chansons pour Elle* (1891). A *Choix de Poésies* of Verlaine was published in 1891. See Ch. Morice, *Paul Verlaine* (Paris, 1894); Jules Lemaître, *Les Contemporains*, vol. iv. A. G. CANFIELD.

Vermejo, vär-mā'khō (sometimes written *Bermejo*): a river of South America; one of the western branches of the Paraguay. It rises in Southern Bolivia, receiving affluents from the mountain regions of Salta and Jujuy, Argentine Republic; flows S. E. through the plains of the Argentine Chaco, and joins the Paraguay by a network of channels a little above the confluence of the latter with the Paraná. In its middle course it is very tortuous and the channel is frequently lost in swamps; hence it is not available for navigation and various schemes for its canalization have come to nothing. It separates the territories of Chaco and Formosa. Length over 800 miles. H. H. S.

Vermes (Lat.): See WORMS.

Vermicelli: See MACARONI.

Ver'mifuges [Lat. *ver'mis*, worm + *funga're*, put to flight]: medical remedies intended to remove worms from the stomach and intestines. See ANTHELMINTICS.

Vermigli, vär-měel'yĕe, PIETRO MARTIRE, generally known as PETER MARTYR: theologian; b. in Florence, Sept. 8, 1500; entered the order of St. Augustine in 1516, and made a comprehensive study of theology and philosophy. While prior of the monastery of St. Peter ad Aram, near Naples, he became acquainted with several converts to the Reformed Church, among them Juan Valdes, and with the writings of Luther and Zwingli, and in 1541, when removed to the monastery of San Frediano, near Lucca, began to preach openly the doctrines of the Reformed creed. The Roman Inquisition soon became aware of the movement which took place in Lucca, but Vermigli succeeded in escaping; fled to Switzerland in 1542, and was made Professor of Theology soon after in the University of Strassburg. In 1547 he went to England on the invitation of Cranmer, and lectured on theology in Oxford, but on the accession of Queen Mary (1553) returned to Strassburg; in 1556 was made Professor of Theology in Zurich, where he died Nov. 12, 1562. He was considered one of the most learned theologians of his age, and besides commenting on various parts of the Bible, especially the Old Testament, he took part largely in the theological controversies of his time. A selection of his works was published in 1575 by Robert Masson, and forms one of the principal sources of information concerning the theology of the Reformed Church of the sixteenth century. See his *Life*, by K. Schmidt (Elberfeld, 1858). Revised by S. M. JACKSON.

Vermilion: See CINNABAR.

Vermillion: city; capital of Clay co., S. D.; on the Vermillion river, and the Chi., Mil. and St. Paul Railway; 30 miles S. E. of Yankton, 35 miles N. W. of Sioux City, Ia. (for location, see map of South Dakota, ref. 8–G). It is in an agricultural region, is built on a table-land overlooking the valleys of the Missouri and Vermillion rivers, has an abundance of good water, and has a national bank with capital of $50,000, a State bank with capital of $40,000, and a monthly, a semi-monthly, and 3 weekly periodicals. Vermillion is the seat of the University of South Dakota (see SOUTH DAKOTA, UNIVERSITY OF). Pop. (1880) 714; (1890) 1,496; (1900) 2,183.

EDITOR OF "DAKOTA REPUBLICAN."

Vermont: one of the U. S. of North America (North Atlantic group); the first State admitted into the Union after the adoption of the Federal Constitution by the original thirteen States; popularly known as the "Green Mountain State." Capital, Montpelier.

Location and Area.—It lies between lat. 45° 3′ and 42° 44′ N., and lon. 71° 30′ and 73° 25′ W.; is bounded N. by the province of Quebec, E. by New Hampshire, S. by Massachusetts, W. by New York; extreme width, 90 miles; minimum width, 41 miles; extreme length, 158 miles; area about 10,200 sq. miles (6,586,880 acres).

The seal of Vermont.

Physical Features. — The surface of the State is everywhere irregular and broken; mountains, valleys, lakes, rivers, hills, cliffs, plains, and meadows combine to produce varied and beautiful scenery. The northern portion, where the main range of the Green Mountains is re-enforced by several parallel ranges, is more rugged than the southern, but nowhere are there plains of large extent. The highest point of the range is the so-called Chin on Mt. Mansfield, which is 4,389 feet above the sea. Other high peaks are Camel's Hump, 4,188; Killington, 4,380; Mansfield Nose, 4,071; Lincoln, 4,024; Jay Peak, 3,861; Equinox, 3,847; and Ascutney, 3,300; and there are many summits over 3,000 feet high. With the exception of a very few of the highest peaks, these mountains are covered with dense forests of evergreen trees, chiefly spruces, whence the name. The drainage of the State is chiefly from the mountains E. and W. The Missisquoi, Lamoille, Winooski, Otter, and Poultney rivers flow into Lake Champlain; the Mulhegan, Passumpsic, Wells, Ompompanoosuc, White, Queeche, Black, Williams, West, and Deerfield into the Connecticut; the Clyde, Barton, and Black into Lake Memphremagog; and the Battenkill and Hoosac into the Hudson. Lake Champlain is 126 miles long, with extreme width of 13 miles. The islands—Grand Isle, North Hero, Isle la Motte, with the Alburgh peninsula—form one of the counties. About three-fourths of this lake and one-fourth of Memphremagog are in Vermont. Of the lakes wholly within the State the principal are Bombazine, Willoughby, Salem, Seymour, Dunmore, and Groton, each several miles in length and breadth, and there are over 200 smaller lakes and ponds.

Geology.—A large part of the rocks are metamorphic. In the vicinity of Lake Champlain there are outcrops of stratified rocks, and the headlands that are seen along the eastern shore are of these rocks, as are the islands. These strata present a conformable series from Lower Cambrian through the Calciferous, Chazy, and Trenton, to the Cincinnati, and upon the often grooved and polished surfaces of these ledges rest the deposits of the Quaternary. In a few limited areas there are Tertiary strata, the most important of which are at Brandon. The Cambrian beds include the Georgia slates, famous for *Olenellus* and other Primordial fossils, and the great Red Sandrock formation, including the Swanton and Mallett Bay marbles, which extends along Western Vermont for about 90 miles, with a thickness of several thousand feet. The Calciferous is also largely developed in the lake region, and the larger islands are mainly composed of this and the Chazy. On Owl's Head, near Memphremagog, there is a small area of Upper Helderberg strata, and on the southern border a small patch of Lower Helderberg. A few miles eastward from Lake Champlain the rocks become metamorphic, and the sandstones and limestones are transformed into schists, slates, marble, granite, gneiss, etc. The Green Mountains are made of these, the crystallization and metamorphism of the Cambrian and Silurian strata having occurred at the close of the Lower Silurian, and the elevation of the mountains at the same time. The Champlain valley appears to have been connected with the valley of the Hudson and with that of the

VERMONT
QUEBEC
NEW HAMPSHIRE
MASSACHUSETTS
NEW YORK
FRANKLIN
GRAND ISLE
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
WASHINGTON
CALEDONIA
ORANGE
ADDISON
RUTLAND
WINDSOR
WINDHAM
BENNINGTON
Burlington
Colchester
Winooski
Essex Jc.
Williston
Shelburne
Hinesburg
Charlotte
Monkton
Starksborough
Ferrisburgh
Vergennes
Panton
Waltham
New Haven
Weybridge
Addison
Brooksville
Middlebury
Bridport
Cornwall
Shoreham
Larrabee's Pt.
Orwell
Chipman's Landing
Benson Landing
Benson
West Haven
Hydeville
Fair Haven
Whitehall
Poultney
Wells
Pawlet
Rupert
Dorset
W. Rupert
Factory Pt.
Sangate
W. Arlington
Arlington
Sunderland
Shaftsbury
Glastonbury
N. Bennington
Bennington
Woodford
N. Powlet
Pownal
Stamford
N. Adams
Rouses Pt.
Highgate Sprs.
Franklin
Berkshire
Swanton
Highgate
Enosburgh Falls
Sheldon
E. Swanton
St. Albans
St. Albans Bay
Fairfield
North Fairfax
North Georgia
East Georgia
West Georgia
South Hero
Milton
Fairfax
Westford
Cambridge
Malletts Bay
Pleasant Valley
Underhill
Jericho
Jericho Centre
Richmond
Jonesville
Bolton
N. Duxbury
Waterbury
Waterbury Cen.
Moretown
N. Fayston
Waitsfield
Warren
Roxbury
Brookfield
E. Granville
Braintree
W. Braintree
Granville
Hancock
Rochester
Leicester
Sudbury
Brandon
Rutland
Pittsford
Hubbardton
Proctor
Castleton
W. Rutland
Clarendon Springs
Clarendon
Ira
E. Poultney
Middletown Sprs.
Tinmouth
S. Wallingford
Mt. Tabor
Danby
N. Dorset
E. Dorset
Peru
Londonderry
S. Londonderry
Manchester
Sunderland
E. Arlington
Arlington
Bennington
Woodford
Readsborough
Stamford
Pownal
Shelburne
Charlotte
Starksborough
Waltham
Bristol
Lincoln
Brooksville
Middlebury
E. Middlebury
Ripton
Salisbury
L. Dunmore
Leicester
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Fair Haven
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Wallingford
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Mt. Holly
S. Wallingford
Mt. Tabor
Danby
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Dorset
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Pawlet
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Glastonbury
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Bennington
Woodford
N. Powlet
Pownal
Stamford
N. Adams
Richford
Franklin
Berkshire
Franklin Pd.
Highgate Sprs.
Swanton
Enosburgh Falls
Sheldon
E. Berkshire
Montgomery
Enosburgh
Fairfield Sta.
E. Fairfield
Bakersfield
Belvidere
Eden Mills
Eden
Waterville
Fletcher
Fairfax
Cambridge
Jeffersonville
Hyde Park
N. Hyde Park
Craftsbury
N. Craftsbury
Morrisville
Elmore
E. Elmore
Stowe
Mansfield Mt.
Jonesville
Bolton
Waterbury
Waterbury Cen.
Moretown
N. Fayston
Waitsfield
Warren
Roxbury
Brookfield
E. Granville
Braintree
W. Braintree
Granville
Hancock
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Tinmouth
S. Wallingford
Mt. Tabor
Danby
N. Dorset
E. Dorset
Peru
Londonderry
S. Londonderry
Manchester
Sunderland
E. Arlington
Arlington
Bennington
Woodford
Readsborough
Stamford
N. Adams
Lake Bombazine
Pico Mt.
Killington
Rutland Pk.
Austin L.
Mt. Equinox
Batten Kill R.
Lake Champlain
Lake Memphremagog
Lake Willoughby
Lake Seymour
Lake Salem
Lake Belle Water Pond
Lake Caspian
Lake Wells River Pd.
Lake Joes Pd.
Lake Salem Pd.
Lake Fairlee Ln.
Lake Ascutney Mt.
Lake Camel's Hump
Lake Mt. Equinox
Lake Austin L.
Lake Bombazine
Lake Dunmore
Lake Seymour L.
Lake Island Pond
Lake Willoughby Lake
Lake Belle Water Pond
Lake Caspian

St. Lawrence during its early history, the land between Whitehall and Troy having been raised in the later Quaternary. The drift, sands, gravel, bowlders, clays, and terraces of the Quaternary are everywhere abundant.

Soil and Productions.—Although much of the soil is stony and sterile there is considerable that is productive, and the average yield of many crops to the acre is greater than the average for the U. S. The State is an agricultural one, and the most important agricultural interest is that of dairying. Besides private dairies there were in operation in 1894 204 creameries, capable of using the milk of 81,388 cows, and the annual production of butter is 23,314,063 lb. and of cheese 609,586 lb. Along the shores and on the larger islands of Lake Champlain there are large and productive apple and pear orchards. The sugar-maple grows in most parts of the State, and the production of sugar and sirup from the sap is one of the great industries. In 1889 there were made 14,123,921 lb. of sugar and 218,252 gal. of sirup, the whole valued at $1,248,856.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms	35,522	32,573	8·3
Total a·reage of farms	4,882,588	4,395,646	10·0
Total value of farms, including buildings and fences	$109,346,110	$80,427,490	26·4

* Decrease.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1900:

CROPS.	Acreage.	Yield.	Value.
Corn	48,477	1,939,080 bush.	$969,540
Wheat	3,489	81,992 "	63,954
Oats	106,581	3,719,677 "	1,339,084
Rye	2,887	47,924 "	29,234
Barley	17,210	500,811 "	260,422
Buckwheat	9,535	238,375 "	119,188
Potatoes	24,666	3,305,244 "	1,322,098
Hay	860,100	1,066,524 tons	11,785,090
Totals	1,072,945	.....	$15,888,610

On Jan. 1, 1900, the farm animals comprised 84,388 horses, value $4,514,500; 268,886 milch cows, value $8,577,463; 132,450 oxen and other cattle, value $3,100,074; 169,259 sheep, value $611,363; and about 70,000 swine, value $700,000—total head, 724,983: total value, $17,503,400.

Flora and Fauna.—The forests, which cover vast areas on the mountain slopes, are largely of spruce and fir, with hemlock and pine on the lower slopes. The hillsides bear groves of maple, beech, and birch (white, black, and yellow), and on the lowlands are walnut, ash, several species of oak, butternut, poplar, and elm. In all there are some fifty species of native trees and twice as many of large shrubs, with about 1,300 species of herbaceous plants. On the higher mountains near their summits are found arctic plants, such as *Saxifraga aizoon*, while on the sandy shores of Lake Champlain are sundry plant reminders of ancient days when the water was salt. The general flora shows a mingling of Canadian, Southern, and Western species. The larger wild animals formerly common in the State have either disappeared or become very rare. The panther, black bear, and deer are still occasionally found, and the raccoon, otter, mink, muskrat, porcupine, skunk, woodchuck, squirrels, etc., are more or less common. Among birds there are the golden and the white-headed eagle, the former very rare, the latter common in the lake region, numerous hawks, owls, ducks, and other water-birds, besides many species of song-birds. The waters of the larger lakes and streams supply many varieties of fish, such as trout, muskelonge, pike, bass, pickerel, whitefish, sturgeon, etc.

Mineral Productions.—The rocks of Vermont constitute an important part of its wealth. There are about 170 quarries, some of them very large, from which great quantities of marble, granite, slate, and soapstone are obtained. More than two-thirds of all the marble quarried in the U. S. is taken from these quarries. The capital invested in the marble quarries and mills of the State is over $19,000,000, and the annual production is valued at nearly $4,000,000. Most of this is found in Rutland and Addison Counties, the principal quarries being at Dorset, West Rutland, Proctor, Pittsford, Middlebury, and Brandon. The marble from these quarries varies from the purest statuary, through that in which black or dark veinings are increasingly abundant, to that which is very dark or almost black. These marbles appear to be metamorphic Chazy limestone. From the unaltered limestone fine jet-black marble is obtained in several localities, and there are quarries of serpentine, verd antique, and other varieties, but these are worked only to a limited extent. Granite of excellent quality is found in many localities, and the quarries are becoming more and more numerous and important. The principal quarries in operation are at Barre, Ryegate, Hardwick, and Brunswick. The annual output is valued at about $1,200,000. Roofing-slate is found in three areas or belts; the chief quarries are at Castleton, Fair Haven, and Northfield; and the annual output is valued at about $800,000. Soapstone is quarried at Athens, Perkinsville, Cambridgeport, and elsewhere, the annual product being worth about $20,000. Vermont is not rich in mines. The largest ones are in Corinth and Vershire, where for many years chalcopyrite has been mined for copper. Gold, silver, lead, iron, and manganese are found in limited quantities. Many minerals of interest to the scientist, though of little commercial value, are found, such as talc, calcite, rutile, actinolite, chrysoprase, tourmaline, epidote, cyanite, garnet, etc.

Climate.—The climate is variable and liable to sudden changes. The northern and eastern portions of the State are colder than the western. At Burlington the mean annual temperature is 45° F. The highest temperature is seldom above 80° F., the lowest not often below −15° F., though there are days in which the thermometer exceeds these limits. Lake Champlain usually freezes over, the average date of closing being Jan. 29, that of opening Apr. 15. The average monthly temperature and rainfall at Burlington in 1873–93 were as follows:

MONTHS.	Temperature.	Rainfall.	MONTHS.	Temperature.	Rainfall.
January	19·75° F.	1·82 in.	July	70·62° F.	3·60 in.
February	21·21	1·20	August	67·91	3·49
March	28·52	1·76	September	60·80	3·48
April	43·10	1·82	October	48·35	3·03
May	56·35	2·80	November	36·30	2·67
June	66·80	3·47	December	47·50	1·94

The average temperature in most other parts of the State is three or four degrees lower and the rainfall rather greater.

Divisions.—For administrative purposes Vermont is divided into fourteen counties as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	*Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop.† 1900.
Addison	5-A	22,277	21,912	Middlebury	3,045
Bennington	9-B	20,448	21,705	Bennington	8,033
				Manchester	1,955
Caledonia	4-D	23,436	24,381	St. Johnsbury	7,010
Chittenden	4-B	35,389	39,600	Burlington	18,640
Essex	3-E	9,511	8,056	Guildhall	455
Franklin	2-B	29,755	30,198	St. Albans	6,239
Grand Isle	3-A	3,843	4,462	North Hero	712
Lamoille	3-C	12,831	12,289	Hyde Park	1,472
Orange	5-C	19,575	19,313	Chelsea	1,070
Orleans	2-D	22,101	22,024	Newport	3,113
Rutland	7-B	45,397	44,209	Rutland	11,499
Washington	4-C	29,606	36,607	Montpelier	6,266
Windham	9-C	26,547	26,660	Newfane	905
Windsor	7-C	31,706	32,225	Woodstock	2,557
Totals		332,422	343,641		

* Reference for location of counties, see map of Vermont.
† Including township.

Principal Cities and Villages, with Population in 1900.—Burlington, 18,640; Rutland, 11,499; Barre, 8,448; Montpelier, 6,266; St. Albans, 6,239; St. Johnsbury 5,666; Bennington, 5,656; Brattleboro, 5,297; Bellows Falls, 4,337; Winooski, 3,783; Fair Haven, 2,470; Springfield, 2,040; Proctor, 2,013.

Population and Races.—In 1860, 315,098; 1870, 330,551; 1880, 332,286; 1890, 332,422 (native, 288,334; foreign, 44,088; males, 169,327; females, 163,095; whites, 331,418; colored, 1,004, including 937 persons of African descent, 33 Chinese, 34 civilized Indians).

Industries and Business Interests.—In 1890 there were in operation 3,031 manufacturing establishments, with a capital of $32,763,291, employing 24,894 persons, paying $10,096,549 for wages and $20,433,174 for materials, and producing goods of the value of $38,340,066. Some of these, as the scale-works in St. Johnsbury, the organ-works in Brattleboro, the scale-works in Rutland, and the agricultural-implement

works in Bellows Falls, are very extensive. Aside from the quarry and dairy products, as well as those of the establishments already mentioned, the principal articles manufactured are woolens, cotton, leather, paper, furniture, lumber, and drugs.

Commerce.—A commerce of considerable importance is carried on through Lake Champlain, and there is also a large traffic with Canada. Burlington is the only port of entry on the lake, but there are custom-houses at fourteen other places on the Canadian border. In the fiscal year ending June 30, 1900, the imports aggregated in value $6,373,432, and the exports $11,831,449.

Finance.—In 1893 the assessed valuation of all property, real and personal, was $171,283,543, and the estimated true valuation $265,567,323. The total resources of the State, June 30, 1900, were $541,573.99; the total liabilities, $208,658.06. The receipts for the two years ending on that date were $1,630,702.21; the disbursements, $1,513,541.01.

Banking and Insurance.—On Sept. 5, 1900, there were 48 national banks with combined capital of $6,760,000, surplus and profits of $2,499,790.63, and deposits of $10,856,668.08. On June 30 there were 41 mutual savings-banks with $2,889,182 surplus, and $38,290,394 in deposits from 118,354 depositors, and 3 home fire-insurance companies with combined gross assets of $364,493.

Post-offices and Periodicals.—In Jan., 1901, there were 572 post-offices, of which 45 were presidential (1 first-class, 8 second-class, 36 third-class) and 527 fourth-class; of the total, 346 were money-order offices, and 6 were money-order stations. Of newspapers and periodicals in 1901 there were 9 daily, 2 semi-weekly, 55 weekly, 1 semi-monthly, and 10 monthly publications—total, 77.

Means of Communication.—The railways are under the supervision of three commissioners appointed by the Governor and Senate. Most of the lines are operated by the Central Vermont and the Boston and Maine railway companies. In 1899 there were in use 994·83 miles of road.

Churches.—The U. S. census of 1890 gives the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic	79	79	42,810	$866,400
Congregational	198	220	20,465	1,318,100
Methodist Episcopal	228	212	17,268	758,800
Baptist	100	105	8,933	584,500
Protestant Episcopal	63	65	4,335	472,050
Universalist	65	62	2,409	285,000
Free-will Baptist	43	40	2,325	94,375
Spiritualist	10	10	1,966	23,250
Advent	28	26	1,079	26,000
Unitarian	9	10	968	112,500

Schools.—As early as 1761 land was set apart for educational purposes, and this was increased from year to year as the State grew. The district system of common schools prevailed until 1870, when the town system was adopted. The public schools are under the direction of a superintendent, elected by the Legislature, and one supervisor in each county, elected by the people. In 1899 there were 89,396 children of school age, of whom 66,429 attended the public schools. There were 1,821 schools and 3,798 teachers—509 men and 3,289 women. The average monthly salaries were: men, $41.83; women, $25.04. The value of school property was $1,800,000; the revenue for school purposes, $968,813; the expenditure, $974,611. The higher educational institutions include the State University (see VERMONT, UNIVERSITY OF); Middlebury College, chartered in 1800, with collegiate and scientific courses, and 11 instructors and 126 students in 1894; and Norwich University, a military institution with a corps of 13 instructors and 58 students. There are 3 normal schools supported by the State and 27 academies not under State control.

Libraries.—Public libraries are found in ninety-two towns, and all the larger schools have their own libraries.

Charitable, Reformatory, and Penal Institutions.—The greater number of charitable institutions are near Burlington. Here are the Mary Fletcher Hospital (endowment, $470,000); a Home for Destitute Children (endowment, $230,000); the Providence Orphan Asylum (value of property, $50,000); the Howard Mission House (endowment $60,000); the Adams Mission Home (property, $15,000); the Cancer Relief Association; the Home for Aged Women; the Home for Friendless Women (property, $20,000); a Young Men's Christian Association (building valued at $105,000), besides several private retreats and hospitals. At Bennington is a Soldiers' Home supported by the State; at Westminster is Kurn Hattim, a home for friendless boys; at St. Albans is a hospital and the Warner Home for Destitute Children; at Brattleboro is an insane asylum, partly supported by the State, though the institution is not under State control; and at Waterbury is a State asylum. There is in Vergennes a Reform School for wayward boys and girls, and at Rutland a House of Correction for adults convicted of minor offenses. The State prison is at Windsor. The State provides for the small number of blind, deaf, and dumb in its care by sending them to institutions in adjoining States.

Political Organization.—Since 1870 the State officers and Legislature have been elected biennially. The Senate is composed of thirty members, apportioned among the different counties according to population, and the House of one representative from each town without regard to population, there being in all 244. State elections are held in September in even years. The judiciary is elective throughout, the chief justice and six assistant justices of the Supreme Court being elected by the Legislature in joint session; the assistant judges of the county courts by popular vote in the several counties; and justices of the peace by popular vote in the towns.

History.—The French explorer Champlain discovered the lake which bears his name in 1609. At that time, and for many years after, the territory of Vermont was not occupied by permanent villages, but was a battle-field and hunting-ground traversed by wandering parties, at one time by Iroquois, at another by Algonkins, and later by armed bands of French or English. As all the Indian names of lakes, streams, etc., which have been retained are Algonkin, it seems probable that these people held original possession of the territory. Fort St. Anne, on Isle la Motte, was built by the French in 1665, and was the first white settlement, though not a permanent one. Fort Dummer, built near what is now Brattleboro in 1724, was probably the first English settlement. Bennington was settled in 1761 on land granted in 1749 by Gov. Wentworth of New Hampshire, and in 1762 a few families settled in Newbury. Gov. Wentworth claimed the whole territory as a part of New Hampshire, and in time 138 townships were deeded by him in the "New Hampshire Grants." Trouble arose when the Governor of New York also claimed jurisdiction over the same territory under letters from Charles II. Proclamations and counter-proclamations were issued, but the settlers, most of whom had paid the Governor of New Hampshire for their titles, sided with Gov. Wentworth and resisted the claims of New York, and the quarrel which followed continued many years. In 1776 the people of the New Hampshire Grants applied to the Federal Congress for admission to the confederation, but through the influence of New York they were refused. They then formed an independent republic, at first called New Connecticut, but later Vermont. As an independent State Vermont continued thirteen years. Finally, after again being refused a place with the other States in 1789, Vermont was received as the fourteenth State and the first under the Federal Constitution in 1791. Notwithstanding the exclusive policy of the other States, Vermonters bore their full share of hardships, losses, and expenses of the war of the Revolution. The State also took active part in the war of 1812. In the war of 1861–65 Vermont did more than its share. In proportion to the population its loss in hospital and on battle-field was larger than that of any other Northern State; it furnished 1,500 more men than were called for under all demands; its money contribution to the expenses of the war amounted to over 12 per cent. of the total property valuation; and out of a population of 315,098, having less than the average number of men liable to military duty, it sent 33,288, or more than one-tenth of the entire population. Since the civil war the population and industries of many portions of the State have decreased, but efforts have been made to revive the former activity in farming and manufactures, and with considerable success.

GOVERNORS OF VERMONT.

Thomas Chittenden	1778–89	Samuel C. Crafts	1828–31
Moses Robinson	1789–90	William A. Palmer	1831–35
Thomas Chittenden	1790–97	Silas A. Jenison	1835–41
Isaac Tichenor	1797–1807	Charles Paine	1841–43
Israel Smith	1807–08	John Mattocks	1843–44
Isaac Tichenor	1808–09	William Slade	1844–46
Jonas Galusha	1809–13	Horace Eaton	1846–49
Martin Chittenden	1813–15	Carlos Coolidge	1849–50
Jonas Galusha	1815–20	Charles K. Williams	1850–52
Richard Skinner	1820–23	Erastus Fairbanks	1852–53
Cornelius P. Van Ness	1823–26	John S. Robinson	1853–54
Ezra Butler	1826–28	Stephen Royce	1854–56

GOVERNORS OF VERMONT—CONTINUED.

Ryland Fletcher	1856–58	Roswell Farnham	1880–82
Hiland Hall	1858–60	John L. Barstow	1882–84
Erastus Fairbanks	1860–61	Samuel E. Pingree	1884–86
Frederick Holbrook	1861–63	E. J. Ormsbee	1886–88
John G. Smith	1863–65	W. P. Dillingham	1888–90
Paul Dillingham	1865–67	Calvin S. Page	1890–92
John B. Page	1867–69	Levi K. Fuller	1892–94
Peter T. Washburn	1869–70	Urban A. Woodbury	1894–96
John W. Stewart	1870–72	Josiah Grout	1896–98
Julius Converse	1872–74	Edward C. Smith	1898–1900
Asahel Peck	1874–76	William W. Stickney	1900–
Horace Fairbanks	1876–78		
Redfield Proctor	1878–80		

AUTHORITIES.—Allen, *History of the State of Vermont* (London, 1798); Williams, *Natural and Civil History of Vermont* (Burlington, 1809); Thompson, *History of Vermont* (Burlington, 1842; *Appendix*, 1853); Hall, *History of Eastern Vermont* (New York, 1858); Hall, *Early History of Vermont* (Albany, 1868); Hemenway, *Vermont Historical Gazetteer* (vols. i.–iv., 1868–82); Benedict, *Vermont in the Civil War* (vol. i., 1886; vol. ii., 1888); Vermont Historical Society's *Collections* (Montpelier, 1870); Conant, *Vermont* (Rutland, 1890); Robinson, *Vermont* (New York, 1892, American Commonwealth Series). GEORGE H. PERKINS.

Vermont: village; Fulton co., Ill.; on the Chi., Burl. and Quincy Railroad; 15 miles N. E. of Rushville, 24 miles N. of Beardstown (for location, see map of Illinois, ref. 5–C). It is in an agricultural region, and has a private bank, a weekly newspaper, and manufactories of carriages, spokes, brick, and tile. Pop. (1880) 1,133; (1890) 1,158; (1900) 1,195.

Vermont, University of: an institution of learning situated at Burlington, Vt.; chartered in 1791 and endowed by Gen. Ira Allen with £4,000; faculty organized in 1800; graduated its first class in 1804. Medical instruction was given 1823–34; after a suspension of twenty years this department was reorganized in 1854, and has now (1898–99) 28 instructors and 210 students; students are admitted to lectures only by diploma or upon examination. The academic staff numbers 33 professors, with 292 students in academic courses; the total attendance in all departments is 523. The State Agricultural College was incorporated with the university in 1865, and with this is connected the State experiment station. The university offers the usual courses in arts, in civil, electrical, and mechanical engineering, in chemistry, and agriculture. After the first year the student's work may be specialized, if desired, by means of elective courses. Women are admitted to all departments except the medical. The buildings are mainly new or recently reconstructed. The Billings Library is not surpassed in beauty by any college library structure in the U. S. An elegant dormitory of marble and a fire-proof science building were added in 1895. The library contains 59,500 volumes, including the choice collection made by the Hon. George P. Marsh. This is supplemented by the free library of the city (25,000 volumes). President since 1871, Matthew H. Buckham, D. D. Since 1880 there has been a doubling both of the teaching staff and of the attendance. The income in 1899 was $76,772. JOHN E. GOODRICH.

Vermuyden, vär-mī'den, Sir CORNELIUS: engineer; b. in Zealand, Holland, about 1590; was employed in his native country in raising embankments against the sea; was invited to England in 1621 to repair a breach in the embankment of the Thames; conducted many drainage operations in England up to 1653; published *A Discourse touching the Drayning of the great Fennes* (London, 1842). He died on the Continent about 1660. M. M.

Vernal Grass: See ANTHOXANTHUM.

Verna'tion [Lat. *verna'tio*, deriv. of *verna're*, be like spring, bloom, renew itself, (of a snake) shed the skin, slough, deriv. of *ver*, spring]: the arrangement of leaves in the bud, sometimes called præfoliation. When applied to the arrangement of the floral leaves it is usually called æstivation or præfloration. In general, leaves in the bud may be *alternate* (Fig. 1, A), *opposite* (Fig. 1, B), or *whorled* (Fig. 1, C) upon the axis. With respect to one another they may be *imbricated*, with their edges lapping (Fig. 1, D), or *valvate*, with their edges touching, but not lapping (Fig. 1, E).

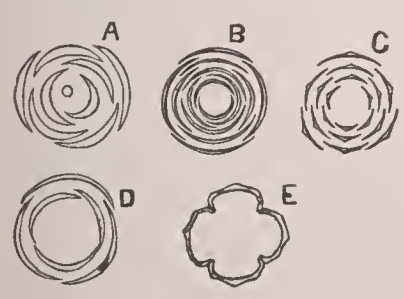


FIG. 1.

The individual leaves may be plane, where the leaves are not folded at all (Fig. 2, A); *conduplicate*, folded lengthwise along the middle so that the upper surfaces of the two halves are together (Fig. 2, B); *plicate* or *plaited*, folded lengthwise along several ribs (Fig. 2, C); *involute*, rolled inward

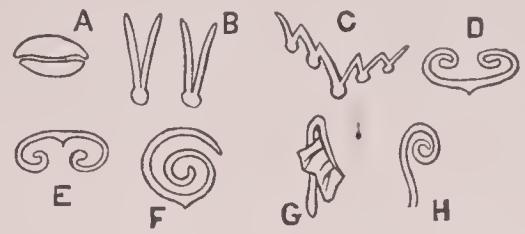


FIG. 2.

on both margins (Fig. 2, D); *revolute*, rolled outward on both margins (Fig. 2, E); *convolute*, rolled inward from one margin (Fig. 2, F); *reclinate*, *replicate*, or *inflexed*, folded transversely so that the upper portion lies upon the lower, or upon the petiole (Fig. 2, G); *circinate*, rolled from the apex downward (Fig. 2, H). CHARLES E. BESSEY.

Verne, JULES: author; b. at Nantes, France, Feb. 8, 1828; studied law in Paris, and made his *début* in literature in 1850 with a comedy in verse, *Les Pailles rompues*; wrote subsequently several other plays, and began in 1863, with his *Cinq Semaines en Ballon*, the vein of surprising adventures based more or less plausibly upon facts of science, which he has since pursued with great success. His most popular work is the *Tour du Monde en 80 Jours* (Around the World in Eighty Days), which was dramatized in 1874, and produced in the Porte St.-Martin theater in Paris. He also wrote *Voyage au Centre de la Terre*; *Vingt Mille Lieues sous les Mers*; *De la Terre à la Lune*; *Le Docteur Ox*; an illustrated geography of France, with Théophile Lavallée (1867–68); *Michel Strogoff*; *Le Rayon Vert* (1882); *Christophe Colomb* (1883); *L'Étoile du Sud* (1884); *Le Château des Carpathes* (1892), and many other books. Most of his works have been translated into English and other languages. He is a member of the Legion of Honor. Revised by A. G. CANFIELD.

Verner, KARL ADOLPH: comparative philologist; b. at Aarhus, in Jutland, Denmark, Mar. 7, 1846; studied in the University of Copenhagen; assistant in the university library in Halle 1876–83; since 1883 Professor of Slavonic Languages in the University of Copenhagen. In 1875 he published in *Kuhns Zeitschrift* an article entitled *Eine Ausnahme der ersten Lautverschiebung* (see VERNER'S LAW), which proved of far-reaching importance not only for Teutonic philology, but also for the methods as well as results of Indo-European comparative grammar. In recognition of this service he was awarded by the Berlin Academy the Bopp premium in 1877, and in 1887 made honorary Ph. D. by the University of Heidelberg. He is author of several other brief articles in linguistic journals. B. I. W.

Verner's Law: a law of sound so named from the discoverer, Karl A. Verner. The discovery was first published in *Kuhns Zeitschrift* in 1875. It embodies an explanation of certain apparent exceptions to the laws for the first shifting of consonants (see GRIMM'S LAW), affecting the representation in Teutonic of the Indo-European voiceless explosives (tenues) *k*, *t*, *p*, and the voiceless sibilant *s*. It appeared, namely, that I.-E. *k*, *t*, *p* produced not only Teutonic *h*, þ (*th*), *f*, as set forth in Grimm's law, but also *g*, *d*, *b*, and that *s* was represented by both *s* and *z*. The essential point of Verner's discovery consisted in the recognition that this diversity was connected with a diversity of the original word-accent of Indo-European. The syllable upon which this accent fell differed in different words and in different forms of the same word, i. e. it was "free." This method of accentuation is partially preserved to us in Sanskrit and Greek, as well as in the Balto-Slavic languages: cf. Skr. *dáça*: Gr. δέκα; Skr. *aṣṭá*: Gr. ὀκτώ: Skr. *páñca*: Gr. πέντε; Skr. *áti*: Gr. ἔτι; Skr. *ahám*: Gr. ἐγώ; Skr. *jánas*: Gr. γένος; Skr. *náva-s*: Gr. νέος; Skr. *svādú-s*: Gr. ἡδύς; Skr. *yugá-m*: Gr. ζυγόν; Skr. *pád*, *pádam*, *padás*: Gr. πούς, πόδα, ποδός, etc. (cf. Wheeler, *Griech. Nominal-Accent*). Verner's law is this: I.-E. medial *k*, *t*, *p*, *s* become Teutonic *h*, þ (*th*), *f*, *s*, which then, if associated with voiced sounds, become voiced (ʒ, *đ*, *b*, *z*), when the I.-E. accent rested upon any other than the preceding syllable; or, to state it in another form, I.-E. *k*, *t*, *p*, *s* appear as *h*, *th*, *f*, *s*, when the I.-E. accent immediately preceded, otherwise (except before *s* or *t*) as *g*, *d*, *b*, *z*. Examples:

Skr. *çváçura-s*: Germ. *schwäher*, "father-in-law," on the other hand, Skr. *çvaçrū́*: Germ. *schwieger* (*-mutter*), "mother-in-law"; Gr. δεκάς: Goth. *tigus*. Eng. *-ty* in *thirty*; Skr. *bhrâtar-*, brother: Gr. φρᾱ́τωρ: Goth. *brōþar*: Germ. *bruder*, but Gr. πατήρ: Goth. *fadar*: Germ. *vater*; Gr. ἑκατόν: Goth. *hund*: Eng. *hund-red*; Skr. *kētū́-s*: Goth. *háidus*: Eng. *-hood*; Skr. *damitá-s*: Eng. *tamed*. Causative verbs in I.-E. were accented on the syllable following the root. Hence from the I.-E. root *wert-*, "turn," of Lat. *verto*, Skr. *vártatē*, Goth. *wairþan*, Germ. *werden*, is derived the causative verb *wortéyeti*, "make turn," cf. Skr. *vartáyati*, Goth. *fra-wardjan*, spoil; from the root *leit-*, go, toil, of Goth. *leiþan*, Germ. *leiden*, is derived the causative *loitéyeti*, "cause to go," cf. Eng. *lead*, Germ. *leiten*.

The Teutonic *z* which results from *s* before the accent becomes in German and Eng. *r*; hence from root *nes-*, return, in Gr. νέομαι, νόστος, Goth. *ganisan*, Germ. *genesen*, we have the causative I.-E. *noséyeti* of Germ. *nähren*; from the root *leis-*, follow a path, experience, in Lat. *līra*, "furrow," Germ. *geleise*, the causat. *loiséyeti*, cause to experience or to know, cf. Goth. *laisjan*, Germ. *lehren*, Eng. *lore*.

The interchange of *s* : *r* in Eng. *was* : *were* is due to the I.-E. usage of accenting the perf. (pret.) on the root in the singular and on the ending in the plur.; cf. Skr. *véda* : *vidmá*. To a similar variation of accent are due the phenomena of grammatical interchange (*grammatischer Wechsel*) in, e. g., *ziehen* : *gezogen* (I.-E. *dukonós*); *schneiden* : *geschitten*; *leiden* : *gelitten*; Eng. *lose* : *forlorn*; *seethe* : *sodden*, etc.

References.—K. A. Verner, *Kuhns Zeitschrift* (1875); K. Brugmann, *Comparative Grammar of the Indo-Germanic Languages*; W. Wilmanns, *Deutsche Grammatik* (7th ed. Berlin, 1887); W. W. Skeat, *Principles of English Ethnology*, first series (1887); King and Cookson, *Sounds and Inflexions*; H. C. G. Brandt, *German Grammar*.

Benj. Ide Wheeler.

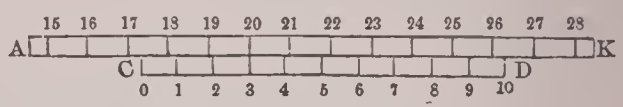
Vernet, vär'nā', Antoine Charles Horace, called Carle Vernet: painter; b. in Bordeaux, France, Aug. 14, 1758; son and pupil of Claude J. Vernet, studied also with Lépicié. He painted pictures concerning the republic and the empire of Napoleon, and under the restoration he was still in favor and was made Chevalier of the Order of St. Michael. Under Louis Philippe he became a member and then an officer of the Legion of Honor. D. in Paris, Nov. 17, 1836. In the Louvre, Paris, is the large and interesting picture *Charles X. hunting at Ville d'Avray*, including portraits of the king and members of the royal family. R. S.

Vernet, Claude Joseph, called Joseph Vernet: painter and engraver; b. at Avignon, Aug. 14, 1714. He was the son of a decorative painter who taught him and sent him to Rome, during which journey he seems to have been impressed by the artistic possibilities of sea-painting, and accordingly, after painting under the instruction of his Roman masters, he devoted himself almost exclusively to marine subjects. D. in Paris, Dec. 3, 1789. In the London National Gallery is the *Castle of Sant' Angelo* and *A River Scene*. In the Louvre, Paris, there are forty-one pictures, including a series of the *Seaports of France*, which were ordered especially by Louis XV. R. S.

Vernet, Émile Jean Horace, generally called Horace Vernet: painter; b. in Paris, June 30, 1789. He was the son of Carle Vernet and grandson of the celebrated Claude Joseph Vernet. It was intended that Horace should study painting, but he failed to obtain the prize and traveling stipend of the Academy and became a conscript; served in the army as a soldier; married, and began to paint battle-pictures entirely according to his own ideas. In 1810 he exhibited *The Capture of a Redoubt*; in 1811, *The Dog of the Regiment* and *The Halt of French Soldiers*; in 1812, *The Taking of an Intrenched Camp*, for which the Academy gave him a medal. The impression that these pictures produced was most extraordinary. Instead of the conventional manner in which the members of the school of David used to imagine a battle, Vernet painted war-scenes and soldiers exactly as he had seen them himself, and through engravings and the newly invented art of lithography his enthusiastic representations of the grand army and its exploits, *The Death of Poniatowski*, *The Bridge of Arcola*, *The Soldier of Waterloo*, etc., passed into the hands of the humblest Frenchmen, and produced their effect. In 1822 his pictures were refused admittance to the exhibition of the Academy on account of their Bonapartist tendency, but Vernet opened a private exhibition. Charles X. sent him in 1827 to Rome as director of the French school there. In 1831 he returned to Paris. His relations with Louis Philippe soon became very friendly, and the king succeeded in alluring the artist's imagination to the conquest of Algeria. Vernet resided in Algeria 1833–35, and visited it again in 1837, 1845, 1853, and oftener. He continued to paint Napoleon—the battles of Jena, Friedland, Wagram, etc.—but from 1836 to his death he chiefly treated subjects of the Algerian campaigns—*The Capture of the Smala*, *The Battle of Isly*, *The Siege of Constantineh*, etc. Besides battle-pieces, he painted a number of pictures, half genre and half historical, such as *Rebecca at the Well*, *The School of Raphael*, *The Lion-hunt*, etc.; several portraits, among which were those of Napoleon I., of Louis Philippe, and of Napoleon III.; and gave a great number of illustrations. D. in Paris, Jan. 17. 1863. See Durande, *Joseph, Carle et Horace Vernet* (Paris, 1845).

Revised by R. Sturgis.

Ver'nier [named for the inventor, Pierre Vernier]: an instrument for measuring a fractional part of one of the equal divisions of a graduated scale or arc. It consists of an auxiliary graduated scale, the divisions of which differ from those of the primary scale. The vernier scale is formed by taking a space equal to an exact number of parts of the primary scale, and dividing it into a number of equal parts, either greater by 1 or less by 1 than the number that it covers on the primary scale. The former is the method of division usually adopted, and the venier as thus divided is the one here explained:



Let A K be a scale of equal parts, and let each part represent 1 foot; let C D be a parallel scale, such that it is exactly equal to 9 parts of the primary scale; suppose C D to be divided into 10 equal parts; then each part will represent ·9 of 1 foot. By means of these scales one can measure distances to within ·1 of 1 foot. Suppose the 0 of the vernier in the first instance to coincide with the division 17 of the primary scale; then the distance from the 0 of the scale to the 0 of the vernier is exactly 17 feet. If we suppose the vernier to slide along the primary scale till the division 1 coincides with 18, the distance from the 0 of the scale to the 0 of the vernier will obviously be equal to 17·1; if it slides along till the division 2 coincides with 19, the distance between the 0 of the scale and the 0 of the vernier is 17·2, and so on. In the present position of the vernier the reading is 17·3. This is obvious, for the distance from the 0 to the divisions which coincide is 20, and the distance from the 0 of the vernier to the same division is three times ·9, or 2·7; hence the difference is 17·3.

The difference between one space on the limb and one space on the vernier is called the *least count*; this is always equal to one space on the limb divided by the number of spaces on the vernier. To read an instrument by means of a vernier, we have the following rule: Read the principal scale up to the last division preceding the 0 of the vernier, and call the result the reading on the limb; then look along the vernier for the division that coincides most nearly with a space on the limb, and multiply the number of that division by the least count; this result is called the reading on the vernier; the sum of the two readings will be the true reading of the instrument.

Vernon: town (taken from Bolton and incorporated in 1808); Tolland co., Conn.; on the N. Y. and New Eng. Railroad (for location, see map of Connecticut, ref. 7–I). It contains the city of Rockville (*q. v.*) and the villages of Vernon, Vernon Center, and Talcottville; had an assessed valuation in 1894 of $2,907,813; and is principally engaged in agriculture and the manufacture of woolen, silk, and cotton goods. Pop. (1880) 6,915; (1890) 8,808; (1900) 8,483.

Vernon: town (founded in 1881); capital of Wilbarger co., Tex.; on the Pease river and the Ft. Worth and Denver City Railway; 167 miles N. W. of Fort Worth (for location, see map of Texas, ref. 1–G). It is in an agricultural and stock-raising region, and has 5 churches, high school, 4 grain elevators, 2 flour-mills, cotton-gin, 2 ice-factories, a private bank, and 4 weekly newspapers. Pop. (1890) 2,857; (1900) 1,993. Editor of "Guard."

Vernon, Edward: naval officer; b. at Westminster, England, Nov. 12, 1684. His father, James Vernon, was Secretary of State 1697–1700. Young Vernon was educated at Westminster and Oxford, but in accordance with his earnest

desire his father secured him a commission in the navy in 1702. During the same year he was present in the action off Vigo, and in 1704 he served under Sir George Rooke in the sea-fight off Malaga. He became rear-admiral in 1708, and remained in active service until 1727, when he was elected to Parliament. As a member of the opposition he became prominent. In 1739, when the question of reprisals against Spain was agitated, he declared that Porto Bello (on the Isthmus of Panama) could be captured with six ships. The Government took him at his word, giving him command of a squadron, with the rank of rear-admiral of the blue. On Nov. 20, 1739, he appeared off Porto Bello with six ships, entered the harbor on the 21st, and laying his vessels close alongside the strongest fort, bombarded it so severely that the Spaniards were driven from their guns and a party of marines carried it under cover of the fire. The other forts surrendered next day, but Vernon, who had no land force, blew them up and abandoned them. He then bombarded Cartagena, New Granada, but was unable to carry the fortifications. He captured the castle of San Lorenzo at the mouth of the Chagres river. These exploits gave Vernon unbounded popularity, and he was commissioned to assemble a powerful force at Jamaica. In Jan., 1741, he sailed from that island with 29 ships of the line and 80 other vessels, carrying 15,000 sailors and 12,000 soldiers, including a contingent from the North American colonies. The land forces were under the separate command of Gen. Wentworth. It was believed that this expedition, in conjunction with that of Anson in the Pacific, would break the Spanish power in America. Vernon appeared off Cartagena Mar. 4, but the harbor was strongly fortified and ably defended, and the divided command of the British foredoomed them to failure. After performing prodigies of valor, the forces were attacked by pestilence: over 5,000 soldiers were lost, and at the end of April the attack was abandoned. Smollett and Lawrence Washington (elder brother of George) took part in this expedition. The former has described it in his novel, *Roderick Random*, and the latter, who conceived a strong admiration for the admiral, named in his honor the estate of Mt. Vernon. Vernon made an unsuccessful attempt against Panama in 1742, and soon after he was recalled to England, where he was charged to guard the southern coast against an expected attack of the Pretender. His popularity continued to be great; but in Apr., 1746, owing to a quarrel with the admiralty, he was dismissed from the service. He continued to sit in Parliament, however. In 1740 he published a *History of Jamaica*. D. at Nacton, Suffolk, Oct. 29, 1757. HERBERT H. SMITH.

Vernon, GEORGE JOHN WARREN, Fifth Baron: scholar and philanthropist; b. at Stapleford Hall, England, June 22, 1803. One of the richest men in England, his life was spent in public services, philanthropy, and devotion to letters. From 1830 to 1835 he was a Member of Parliament, being one of the ardent supporters of the Reform Bill. In 1835, on the death of his father, he became a peer and member of the House of Lords. This interfered with the activity of his political life, but to his death he preserved an eager interest in the liberal progress of his country. As a philanthropist he was deeply beloved, and the memory of his generosity and personal sacrifices at the time of the cotton famine in Lancashire in 1862–63, caused by the civil war in the U. S., still survives. He will be longest remembered, however, for his studies upon Dante and for his generous patronage of important but costly publications concerning that poet. He began his labors in this field with the publication in 1842 of *I primi sette canti dell' Inferno di Dante Alighieri disposti in ordine grammaticale*, a work later enlarged to include the entire *Inferno*, and provided with a volume of notes and dissertations and another of plates, with suitable comments (3 vols. fol., 1858–65). In 1845 he published *Petri Allegheri super Dantis ipsius genitoris Comœdiam Commentarium* (ed. by V. Nannucci). This was followed by *Chiose sopra Dante: Testo inedito* (1846); *Chiose alla cantica dell' Inferno di Dante Alighieri attribuite a Jacopo suo figlio* (1848); *Comento alla cantica di Dante Alighieri di autore anonimo* (1848); and *Le primi quattro edizioni della Divina Commedia litteralmente ristampate* (supervised by Antonio Panizzi, London, 1858). Besides these scholarly publications Lord Vernon wrote in Italian *Ottava rima* a romance of chivalry, *Febùs e Breùs*, which was accepted by the Accademia della Crusca as a *testo di lingua*. D. May 31, 1866. A. R. MARSH.

Vernon, ROBERT, F. S. A.: art-collector; b. in England in 1774; was at one time a dealer in horses; acquired in commercial pursuits a large fortune, which he expended in the purchase of pictures, chiefly by British artists, being a generous patron of artists and literary men of genius, and formed a vast collection of works of art at his country-seat of Ardington House, Berkshire. The best portion of this, comprising 162 pictures and several pieces of statuary (valued at £150,000), he presented to the nation Dec. 22, 1847, to be known as the Vernon Gallery, which now forms the nucleus of the National Gallery of British Art at South Kensington Museum. D. in London, May 22, 1849. A portrait of Vernon by Pickersgill and a bust by Behnes, the latter presented by the Queen, are in the National Gallery.

Vernon-Harcourt, LEVISON FRANCIS; civil engineer; b. in London in 1839; educated at Harrow School and Baliol College, Oxford, taking first class in mathematics and natural science; a pupil of Sir John Hawkshaw from 1862 to 1865, and afterward his assistant. In 1875 he established himself in London, his practice being chiefly hydraulic and maritime work; was expert before committees of the House of Lords on canals, rivers, and water-supply, notably on the Manchester ship-canal in the interest of the Mersey dock board and Northwestern Railway, but supported the revised plans; is Professor of Civil Engineering in University College, London. He has published *Rivers and Canals* (1882); *Harbors and Docks* (1885); *Achievements in Engineering* (1891); *River Engineering and Water Supply*, in *Encyclopædia Britannica*; *Canals*, in *Chambers's Encyclopædia*; and papers in the *Proceedings* of the Institution of Civil Engineers. He has received one Telford medal, three Telford premiums, and the Manly premium. Two papers on his *Investigations on the Effects of Training Walls*, made on models of the Seine and the Mersey estuaries, which have attracted much attention, were read before the Royal Society 1889–91. He became associate of the Institution of Civil Engineers in 1865, member in 1871; vice-president permanent committee of the International Maritime Congress of Paris. W. R. HUTTON.

Veron, ve-rōṅ', LOUIS DESIRÉ: journalist; b. in Paris, Apr. 5, 1798; studied medicine; served in various hospitals, and published *Observations sur les Maladies des Enfants* (1825); wrote absolutist-ultramontane articles in different papers, and was appointed physician at the Royal Museum in 1824; purchased an interest in a medicine, "Pâte Regnauld," which, by his connections with the press, resulted in large sale with corresponding profit, and founded the *Revue de Paris* in 1829, which was devoted to the creation of new celebrities; became director of the grand opera in 1831, as a privileged manager; brought out the opera *Robert le Diable* and the ballet *La Sylphide*, and retired in 1835 with a fortune; bought in 1839 a controlling share of the *Constitutionnel*, the organ of Thiers; became its sole proprietor in 1844; brought it into a flourishing condition by publishing in its columns *Le Juif Errant*, by Eugene Sue, and was introduced in the highest circles of French society by Thiers; became the enthusiastic eulogizer of the *coup d'état* of Dec. 2, 1851; was elected to the Legislative Assembly as a candidate of the Government, and sold the *Constitutionnel* at an enormous profit; endowed anonymously several second-rate literary associations in Paris; published *Mémoires d'un Bourgeois de Paris* (6 vols., 1854); the novel *Cinq cent mille Francs de Rente* (2 vols., 1855); the political history, *Quatre ans de Règne* (1857); and *Les Théâtres de Paris de 1806 à 1860* (1860). D. in Paris, Sept. 27, 1867. Revised by A. G. CANFIELD.

Vero'na: the capital of the province of Verona, Italy. It is situated at the base of the spurs of the Southern Alps, on the Upper Italian Railway, 72 miles W. of Venice (see map of Italy, ref. 2–D), in a fertile plain, and is divided by the Adige (Lat. *Athesis*) into two parts, which are connected by six bridges (three of iron, one, mediæval, of stone). As a fortress Verona constitutes with Peschiera, Mantua, and Legnano the historically famous Quadrilateral, and is the key to the Tyrol from the south. It is surrounded by a circle of forts. Considerable trade in grain, hides, flax, hemp, marble, silk, velvet, linen, and woolen goods is carried on. There are flourishing institutions for science and art, a public library with a remarkable MSS. collection, a picture gallery (mostly of old Veronese masters), an agricultural academy (1768), a botanical garden, various good colleges, including a theological seminary and lyceum, and a private institute for poor girls, founded by Nicolo Mazza, where admirable embroidery

in silk and gold is done and artificial flowers manufactured. Of the many interesting buildings the chief is the old Roman amphitheater (*Arena*) built between 81 and 117 A. D. and wonderfully preserved, with a seating capacity of 60,000 people. The Porta de' Borsari and the Arco de' Leoni are fine Roman gateways, both of the Roman imperial time; the Porta Nuova and the Porta Pallio were built by Sanmicheli. The Piazza delle Erbe, originally the Forum, now a market-square, and the Piazza dei Signori, surrounded by many fine mediæval buildings, with the city-hall (Palazzo del Consiglio) and a monument of Dante (erected 1865), are the most remarkable among the many great squares. There are forty-eight churches, some of them with beautiful works of art, besides a cathedral. The latter was consecrated in 1187 by Pope Urban III., and is decorated with Lombardic sculpture. The ancient basilica of S. Zeno and the Dominican church of S. Anastasia in semi-Gothic style contain early examples of painting and sculpture. Near the old Friar monastery the so-called tomb of Shakspeare's Juliet is shown. Among recent structures the Municipio, the theater opened in 1846, the Teatro Filarmonico, and the railway station (built in 1850) are conspicuous. Verona became a Roman colony with the title *Augusta* in 89 B. C., was the birthplace of Catullus, and probably of Cornelius Nepos; was of greatest importance during the Gothic-Longobardian times, especially as the residence of the Ostrogoth Theodoric, the celebrated Dietrich von Bern (i. e. Verona) of the Germanic saga. It passed from Milanese into Venetian hands, and became Austrian in 1814 and Italian in 1866. Pop. (1893) 69,900. HERMANN SCHOENFELD.

Verona: borough; Allegheny co., Pa.; on the Allegheny river, and the Allegheny Val. Railway; 12 miles E. N. E. of Pittsburg (for location, see map of Pennsylvania, ref. 5–B). It has a national bank with capital of $50,000, a weekly paper, and manufactories of railway-cars, glass, springs, dynamite, powder, and tools. Pop. (1880) 1,599; (1890) 1,477; (1900) 1,904.

Verona, Congress of: a meeting of the European powers in 1822 with the especial design of taking action in regard to the revolution in Spain, where the Bourbon king, Ferdinand VII., had been forced to sign the constitution of 1812 and was at the mercy of the radicals. As at Laibach, the spirit of the congress was reactionary, and, true to the principles of the HOLY ALLIANCE (*q. v.*), its members favored intervention on behalf of the Spanish sovereign. The czar hoped to be the agent to carry out the decree of the congress, but abandoned the project upon learning that France would not permit the passage of Russian troops through her territory. The protest of Great Britain through her envoy, Wellington, prevented the congress from taking formal action against the Spanish revolutionists like that taken against the Neapolitans at the congress of Laibach, but it could not prevent the consent of the powers to the intervention of France as the power chiefly endangered by the revolution. As a result of the congress the Duc d'Angoulême invaded Spain at the head of a large army in 1823, and the despotism of the Bourbons was fully restored.

Veronese, vā-rō-nā'se, PAUL, properly PAOLO CALIARI [called Veronese because a native of Verona]: painter; b. in 1528. He was the son and nephew of artists, and grew up in practice of engraving, modeling, and painting. When at the age of twenty-six he settled in Venice, he had already done independent work in Mantua and in Vicenza. In Venice he was employed upon important work, and he seems to have been recognized from the first as great, even among the great painters of the Venetian school. Titian was then seventy-eight years old, but full of power and at the height of his fame; Tintoretto, sixteen years older than Veronese, was in great favor and producing wonderful pictures; and it must have seemed to their contemporaries that all the power in art not still held by the aged Titian had passed to his energetic, tireless, most original, and most aggressive young rival. (See ROBUSTI.) That Veronese should have been at all recognized as a rival to these two men is a remarkable proof of the power he had already shown and was ready to show at a comparatively early age. His first Venetian work was in the Church of San Sebastiano, the *Coronation of the Virgin*, on the ceiling of the sacristy; soon after came the altarpiece of the high altar, *The Virgin in Glory, with Four Saints*, and the pictures on the side walls of the sanctuary, the *Martyrdom of St. Sebastian* and the *Martyrdom of St. Mark*. The same year he painted the altarpiece *Christ on the Cross, with the Three Marys*. These three last-named pictures may be called the masterpieces of his early time. About 1562 he painted *The Adoration of the Magi*, for the ceiling of the old library in the ducal palace, and in that year he began and finished the *Marriage of Cana*, for the monastery of San Giorgio Maggiore, on the island, but this is now in the *Salon Carré* of the Louvre. This famous picture was a part of the tribute that Bonaparte levied on Venice in 1797; it is about 32 feet long by 20 feet high. In 1565 Veronese was in Rome. In 1570 he painted the picture now in the Academy at Venice, the *Feast in the House of Levi*. This was painted for the convent of SS. Giovanni e Paolo; it is 46 feet long by about 20 feet high; the canvas is filled with an immense architectural composition with three arcades, and the supper-table is beneath this and at the head of a stately flight of steps. The Saviour, with Peter and John, is in the very center of the picture, and this single group is almost as famous a composition as the whole huge picture. A noble figure in a rich green dress, standing in front of one of the great piers of the architecture, is popularly taken for a portrait of Paolo himself, and is known in Venice as *The Green Man*. Immediately after this he painted its rival, *Christ in the House of Levi*, which Venice gave to Louis XIV. in 1665. This is now in the Louvre; it is as long though not as high as the *Marriage of Cana*. In 1573 he painted for a church in Murano the picture in the Venice Academy, *The Virgin in Glory, with Saint Dominic*. In 1577 there was a fire in the ducal palace, in which priceless pictures were destroyed, among them some of Veronese's; but immediately afterward he was employed on the ceiling of the largest hall, the *Sala del Maggior Consilio*. The oval central compartment, which in itself is an immense picture, is *Venice Triumphant*. In this way his life is to be written, as a mere series of artistic undertakings and the production of splendid pictures. He devoted himself to painting, and there has never been a painter whose work is more uniform in excellence. The museums of Europe are full of his works, many of them enormously large, and yet very many remain in the buildings for which they were painted. Of the great Venetian colorists, the greatest colorists in the world, he was one. Loving daylight more than twilight, he does not give the glow and depth of Titian, but he gives something as fine, a system of daylight color never surpassed for beauty. His painting has stood the test of time and exposure exceedingly well. His composition, in line and mass, and also in color, is perfectly easy, natural, and spontaneous. His design is also peculiarly attractive, his men and women are splendid beings, almost more than human in their health and power and stately grace, his costumes are superb, his architectural backgrounds unequaled in painting. He could draw anything with equal ease, and knew as well as any painter who ever lived how to make one touch or one tint do the work of many. In fact, he was one of the five or six greatest painters known to us, and his work must always be a source of delight to those who care for painting for its own sake, as a fine art, having its own special charm, not needing to borrow the means and methods of other arts. He died suddenly in Venice, in the full maturity of his talents, Apr. 19, 1588, and was buried in the Church of S. Sebastiano among his own numerous and splendid works. RUSSELL STURGIS.

Veron'ica: the name given in Christian legend to the woman whose issue of blood was cured by Jesus (Matt. ix. 20), and who afterward, being in Jerusalem, saw him pass to his crucifixion, and gave him her handkerchief that he might wipe his sweaty and bloody brow. He accepted the kindness, and returned the cloth with the impress of his face upon it. The cloth was endowed with curative properties, and wrought many miracles. By order of the Emperor Tiberius Veronica went to Rome, to cure him of leprosy, and prevailed upon him, out of gratitude, and because he was by the miracle convinced of the divinity of Christ, to exile Pilate. She gave the cloth in her will to Clement, the successor of Peter, and it is now preserved in St. Peter's and exhibited at intervals. In the Middle Ages it became the fashion to call the cloth "Veronica." In other forms of the legend she is the niece of Herod, is known as Berenice, and again is an Antiochene martyr. Perhaps the genesis of the legend is to be sought in the story that Jesus sent Abgarus of Edessa his *vera icon*, his true likeness. See K. Pearson, *Die Fronica, ein Beitrag zur Geschichte des Christusbildes im Mittelalter* (Strassburg, 1887). Eusebius (*Church History*, viii., 18) says that he saw at Paneas statues of the woman and Christ. SAMUEL MACAULEY JACKSON.

Verplank', Gulian Crommelin: author and statesman; b. in New York, Aug. 6, 1786; graduated at Columbia College 1801; studied law, and after being admitted to the bar spent several years in Europe; was in 1804 a candidate of the so-called Malcontents for the New York Legislature, to which he was elected many years later, in 1820, when he was chairman of the committee on education; was Professor of the Evidences of Christianity in the General Protestant Episcopal Seminary, New York, in 1821–25; was a member of Congress 1825–33; of the New York Senate (1838–41), in the judicial duties of which he took a principal part; was one of the governors of the New York Hospital, vice-chancellor of the State University, president of the New York board of emigration commissioners 1846–61, of which body he prepared nearly all the *Annual Reports*. D. in New York, Mar. 18, 1870. He was the author of *The Bucktail Bards* and *The Epistles of Brevet Major Pindar Puff*, political satires; *Evidences of Revealed Religion* (1824); *An Essay on the Doctrine of Contracts* (1825); *Discourses and Addresses* (1833); of nearly half the *Talisman* (1819), an annual; of college addresses, reports, speeches, and papers, and of many contributions to magazines. He edited *Shakspeare's Plays, with his Life* (1844–47).

Verrall, Arthur Woolgar: See the Appendix.

Verrazano, Giovanni, da: See Verazzano.

Ver'res: Roman governor of Sicily (73–71 B. C.). He was at first a member of the Marian party, but afterward went over to the side of Sulla, who rewarded him with a share of the confiscated estates of the proscribed party. He was elected prætor in 74 B. C., and in the following year he was sent to Sicily, where he remained three years, amassing an enormous fortune by plundering the inhabitants. The Sicilians succeeded in bringing him to trial, in spite of his wealth and powerful connections. Cicero was his accuser, Hortensius his defender. Before the trial came to a close, Verres fled from Rome. He settled in Gaul, near Marseilles, and brought along with him enough of his wealth to live in luxury and opulence for the rest of his life, and even to excite the greed of Antony, by whose proscription he was put to death in 43 B. C. Revised by F. M. Colby.

Verrius Flaccus: a Roman grammarian. See Flaccus, Marcus Verrius.

Verrocchio, vär-rōk'kĕĕ-ō, Andrea, del: sculptor and painter; b. in Florence in 1435. His first training in art was as a goldsmith. Baldinucci affirms that he was a pupil of Donatello's, together with Pollainolo. The marble basin still existing in the sacristy of S. Lorenzo was made at that time, and was his first important work. He is said to have cast the bronze doors modeled by Luca della Robbia for S. Lorenzo. He also cast the bronze ball that Brunelleschi designed for the dome of the Cathedral of Florence. Verrocchio was commissioned by the Medici to make the tomb of Piero and Giovanni de' Medici in the sacristy of S. Lorenzo, which he completed in 1482. Later he was employed in the decoration of their villa at Careggi, and for them also he made the bronze David now in the Bargello in Florence. The tomb of Francesca Tornabuoni, executed in Rome in 1477, was Verrocchio's first great work in marble. The reliefs for this are now in the museum in Florence. From this date till 1484 Verrocchio divided his time between Rome and Florence. He executed some large silver statues of the apostles for the Sistine chapel, of which no trace remains. About 1480 he made the silver bas-relief of the *Beheading of St. John* for the altar of the baptistery in Florence, now the only remaining example of his goldsmith's work. In 1483 he completed the group of the *Incredulity of St. Thomas* for Orsanmichele. From 1484 to 1488 he worked chiefly on the equestrian statue of Colleoni in Venice. He caught a cold during its casting, and died from its effects in 1488. Verrocchio, although chiefly a sculptor, had more to do with forming the art of painting for his successors than any artist of his time. He was evidently much influenced in his method by Fra Filippo. Of Verrocchio's pictures there is authentic evidence only as to *The Baptism of Christ*, in the Accademia in Florence, of which Vasari says it was in part painted by Leonardo. It is known that many Madonnas were sent out of his studio, and there are several attributed to him by various critics. Verrocchio takes rank among the greatest of the artists of the Renaissance. He was the master of Leonardo da Vinci, of Perugino, and of Lorenzo di Credi, and was a musician and mathematician as well as a sculptor and painter. See Crowe and Cavalcaselle, and Vasari. W. J. S.

Versailles, vär'sälz': capital of the department of Seine-et-Oise, France; 11 miles S. W. of Paris (see map of France, ref. 3–F). It is regularly built, with broad and straight streets, and intersected by elegant avenues planted with trees. It has few manufactures and little trade. The chief attractions of the place are the palace and the park. The palace, an enormous pile, 1,400 feet long, was erected by Louis XIV., and was the residence of the French kings till 1792. In 1837 Louis Philippe transformed it into a national museum, to commemorate the glories of France. The park, with its terraces, alleys, and fountains, was long considered a model of landscape-gardening. Versailles has a national college, a normal school, numerous literary and scientific societies, and a public library of 75,000 volumes. It was here that the German empire was founded in 1871. During 1871–79 it was the seat of the National Assembly and Government of France. Pop. (1896) 54,874.
Revised by M. W. Harrington.

Versailles, ver-sälz': town (laid out in 1794); capital of Woodford co., Ky.; on the Rich., Nicholas, Irv. and Beattyv. and the Southern railways; 15 miles S. E. of Frankfort (for location, see map of Kentucky, ref. 3–H). It is in an agricultural and stock-raising region; contains Rose Hill Seminary (Christian, opened in 1875), 3 State banks with combined capital of $210,000, and several factories; and has a weekly newspaper. Pop. (1880) 2,126; (1890) 2,575; (1900) 2,337.

Versailles: town; capital of Morgan co., Mo.; on the Mo. Pac. Railway; 30 miles S. E. of Sedalia, 40 miles S. W. of Jefferson City (for location, see map of Missouri, ref. 5–G). It is in an agricultural, grazing, and mining region; yields coal, iron, lead, copper, and kaolin; and has a male and female institute, 2 State banks with combined capital of $45,000, and 2 weekly newspapers. Pop. (1890) 1,211; (1900) 1,240.

Versailles: village (founded in 1851); Darke co., O.; on the Cin., Day. and Chi. and the Cleve., Cin., Chi. and St. L. railways; 41 miles N. W. of Dayton (for location, see map of Ohio, ref. 5–C). It is in an agricultural region, and has five churches, a public and a parochial school, a private bank, and a weekly paper. Pop. (1880) 1,163; (1890) 1,385; (1900) 1,478. Editor of "Policy."

Verse [Lat. *versus*, a turning]: a line of poetry usually forming a well-rounded rhythmic period. The maximum length assigned by the ancients was thirty or thirty-two moræ or short syllables (a long being counted as twice a short). In lyric poetry and in systems a period often exceeds this length, and the cola, or groups of cola, are written as verses. Each verse is theoretically marked by one chief stress, and regularly has a slight pause at the end not included in the rhythm. (See Prosody and Metres.) "Verse" is often used for "stanza," and also is used collectively in the sense of "poetry," but usually in reference to the mere form. Milton W. Humphreys.

Versecz, or **Wershetz**, ver-shets': town; in the county of Temes, Hungary; on the Temesvár-Bazias Railway (see map of Austria-Hungary, ref. 9–I). It has a Greek theological seminary, a real-school, is the seat of a Greek bishopric, and the center of an extensive trade in silk and wine. The town was taken by the Austrians in 1849. Pop. (1890) 22,122 (57·5 per cent. Germans). H. S.

Vertebra: See Osteology and Spinal Column.

Vertebra'ta [Mod. Lat.; in form, liter., neut. plur. of Lat. *vertebra'tus*, jointed (deriv. of *ver'tebra*, joint, joint of the spine), in meaning deriv. of Mod. Lat. *ver'tebra*, vertebra]: the highest and most important branch of the animal kingdom. In common with the other Chordata (*q. v.*) the vertebrates are segmented animals which possess a primary axial skeleton (notochord) between the digestive and nervous systems, a nervous system which is not traversed by the alimentary tract, and gill-slits, at least in the embryo, leading outward from the throat. Indeed, the term *Vertebrata* is often used as synonymous with *Chordata*. A strict limitation, however, excludes the *Tunicata*, *Enteropneusti*, and *Leptocardii*.

The vertebrates are bilaterally symmetrical. The body is covered with an epidermis several cells in thickness, from which or from the subjacent dermis may be developed protective structures—scales, feathers, or hair. The central nervous system consists of an anterior enlargement, the brain, and a posterior prolongation, the spinal cord. The latter is markedly segmented, and from each segment arises a pair of spinal nerves, which are distributed to the parts of the corresponding body segment. Each of these nerves

arises by two roots, which differ in character. The dorsal root has an enlargement or ganglion, and is sensory in function, while the ventral root lacks a ganglion, and is motor in nature, influencing the action of the parts to which it is supplied. In the brain corresponding segments are not easily recognized, and the nerves which arise from this region are not easily brought into harmony with the spinal nerves. In the brain five regions may be distinguished: in front, a pair of cerebral hemispheres, next an unpaired optic thalamus, third the optic lobes, fourth the cerebellum, and lastly the medulla oblongata, an expansion of the spinal cord. Both brain and cord are traversed by a canal, and in certain regions of the brain this expands into "ventricles." Of these there are four, one in each cerebral hemisphere, one in the thalamus, and one in the cerebellum and medulla.

There are three sensory outgrowths which arise from the brain, the paired eyes and the pineal or PARIETAL EYE (*q. v.*), which is probably functional in no existing vertebrate. From the cerebral lobes arise the olfactory nerves, which go to the nose; from the thalamus arise the optic and pineal nerves; from the optic lobe region, the oculomotor nerves; while the remaining nerves—eight pairs in the higher vertebrates—start from the medulla. From the floor of the thalamus a curious downgrowth—the infundibulum—occurs. Its nature is problematical. The special sense-organs are three—the nose, eyes, and ears. In the lampreys the nose is median; in the other forms it is paired. In only the higher vertebrates is there a passage through the nose to the throat. For the details of EYE and EAR, see those articles. In the aquatic vertebrates another set of sense-organs—those of the lateral line—need mention. They are tubular structures distributed over the head and extending along the side of the body and opening to the exterior by pores. They are supplied by branches of the tenth (vagus) and fifth (trigeminal) nerves.

The vertebrate skeleton may be divided into axial and appendicular portions. The axial consists of the vertebræ, skull, and ribs; the appendicular—lacking only in the lampreys and some snakes—supports the appendages. Each vertebra consists of a centrum, which arises in the tissue around the notochord, and a neural arch which arises from the centrum and incloses the spinal cord. The vertebræ are intersegmental in position, alternating with the spinal nerves. Besides the neural arch there may be a similar arch arising from each centrum below (hæmal arch), and forming the ribs in fishes, or there may be transverse outgrowths from the sides, the distal portions of which may become jointed, giving rise to the ribs of the higher vertebrates. By a fusion of the lower ends of the ribs a breastbone or sternum may be formed. The vertebræ, ribs, and sternum are at first cartilage, and in many forms (e. g. sharks, lampreys) are never converted into bone. The SKULL (*q. v.*) is laid down in cartilage. In it may be recognized a capsule for the protection of the brain and sense-organs (cranium) and the face, including the jaws. These may all persist as cartilage, or they may be ossified and re-enforced by other bones developed in the skin, and later united with the skull. In the more primitive forms the number of separate bones is large; ascent in the scale is usually accompanied by a fusion of separate elements. Thus the single sphenoid bone of man is represented by about twenty distinct bones in lower forms. In the facial region the jaws are the center about which the most modification arises, and in connection with them are to be mentioned the skeletal supports of the gills (gill-arches). Usually the mouth is armed with teeth, and these may occur in other parts than the jaws proper. It is of interest to note here that the teeth are probably to be regarded as modified scales, for in their structure and development they are closely similar to the scales of the sharks. The appendicular skeleton consists of the supports to the fore and hind limbs. There is a girdle of bones (pectoral or pelvic) surrounding the body, and consisting, in its extreme development, of three bones on either side. These are the scapula (or shoulder-blade) above, and the coracoid and clavicle, in the pectoral girdle; and the dorsal ileum, and the ventral pubis and ischium in the pelvic girdle. At the junction of these elements arises the skeleton of the limb proper, which in the swimming forms has a low development, but which in all others can be more or less closely compared to that of man. For details of the skeleton, see OSTEOLOGY and SKELETON.

The digestive system begins with the mouth, after which come in order pharynx, œsophagus, stomach, and intestines, the last frequently showing differentiation into several portions. These either open directly to the exterior or terminate in a cloaca which also receives the urinary and genital ducts. From the intestinal region are developed as outgrowths two special digestive glands, the pancreas and liver. In the water-breathing forms the sides of the pharynx are perforated by gill-slits, the walls of which are covered by delicate plates or fringes in which the blood circulates, while water coming in through the mouth passes to the exterior through the slits, and is thus brought into close connection with the blood, so that an exchange of oxygen and carbon dioxide is readily effected. In the higher forms these gill-slits persist for but a short time, and in the mammal or bird one only can be found in the adult—the Eustachian tube—which, closed at the outer end, connects the middle ear with the throat. In the air-breathing vertebrates the gills are replaced by lungs, a pair of organs developed from the floor of the throat, just behind the gill-slits and extending back into the body. The connection of these with the air-bladder of fishes is very uncertain. The heart, the central organ of circulation, is primitively placed below the alimentary tract, just behind the gill-slits. It receives blood from behind, and in its simplest form consists of two chambers, an auricle which receives the blood and a ventricle which propels it forward. Passing from the heart, the blood in all gill-bearing forms passes into a ventral aorta, which gives off arteries passing up through the solid walls between the gill-slits. These arteries give off smaller vessels, which, after passing through the gills, unite above the pharynx in the dorsal aorta, which runs backward through the body. From this simple system are developed by modification and suppression of parts the circulatory organs of all vertebrates. In the highest air-breathing forms a partition forms, dividing the auricle and ventricle, thus giving rise to the four-chambered heart. From the posterior artery through the gills is developed the artery leading to the lungs, while the other gill-arteries are variously modified or suppressed. There is, besides, a so-called lymph system, consisting of vessels and spaces ramifying all parts of the body, and communicating, here and there, with the blood-circulatory system. In certain forms, portions of this lymph system become specialized into contractile organs, the lymph hearts. A portion of the lymph system, the chyle ducts, play an important part in transferring the products of digestion into the general circulation.

The body cavity (CŒLOM, *q. v.*) is well developed. It arises as a series of small paired cavities, the upper parts of which become obliterated while the lower parts flow together, giving rise to the pleuro-peritoneal cavity of the adult. A portion of this is always cut off to form the pericardial cavity surrounding the heart, and in the higher vertebrates the remainder is divided by a muscular partition—the diaphragm—into pleural and peritoneal chambers. These cavities surround the digestive canal.

The excretory system in the lower forms consists of a paired series of funnels connecting the body cavity with a longitudinal tube leading back to open near the vent. Connected with the funnel tubes are capillary networks (glomeruli), through which nitrogenous waste is passed from the blood into the excretory canals, the whole being strikingly similar to the nephridia of the Annelids. In the higher vertebrates this system undergoes complex modifications, the duct becoming divided into two tubes, the Wolffian and Müllerian ducts, which are variously related to reproduction and excretion in the two sexes. The sexual organs are paired, and in only rare instances are the two sexes united in the same individual. The sexual products are carried to the exterior by the modified excretory ducts, and in certain forms—some sharks, skates, fishes, Batrachia, and mammals—a portion of the duct is specialized into a uterus, where a part of the development of the egg takes place.

The branch of vertebrates is divided into the Cyclostomata, including the lampreys and hag-fishes (see MARSIPOBRANCHIA), in which no true jaws are developed, and the Gnathostomata, with jaws, including all other forms. For the divisions of the latter, see the articles FISHES, AMPHIBIA, SAUROPSIDA, and MAMMALS.

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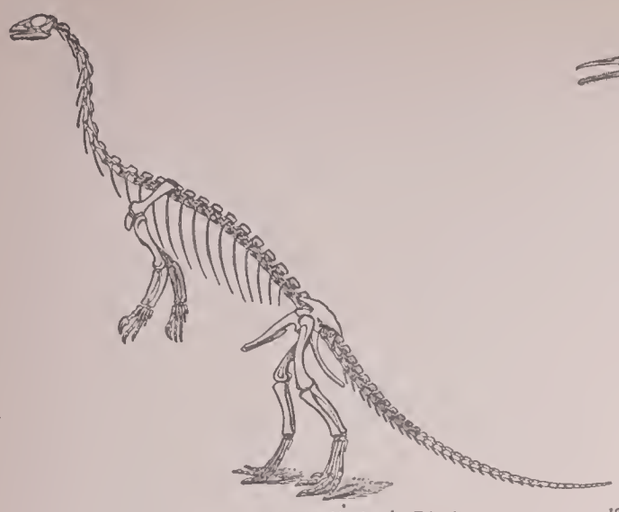
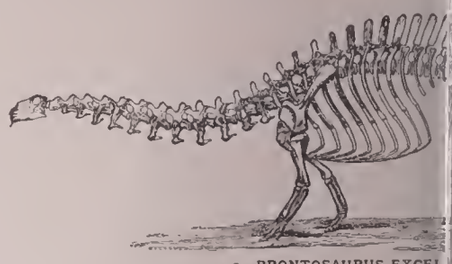
J. S. KINGSLEY.



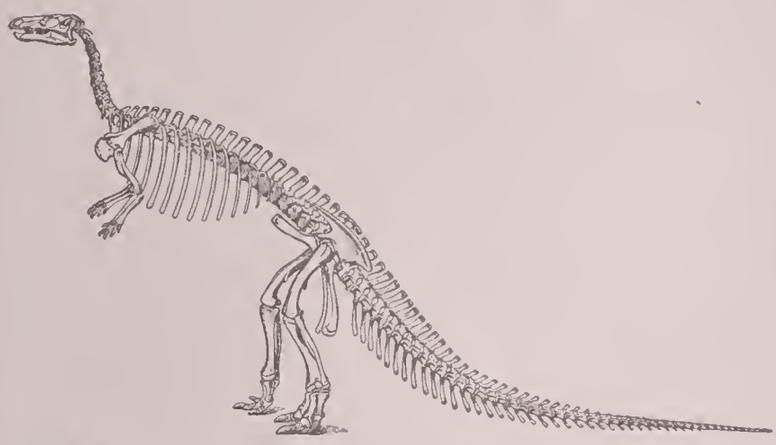
1.—ANCHISAURUS COLURUS, Marsh. $\frac{1}{24}$ Triassic.

10.—HESPERORNIS REGALIS, Marsh. $\frac{1}{15}$ Cretaceous.

9.—RHAMPHORHYNCHUS PHYL

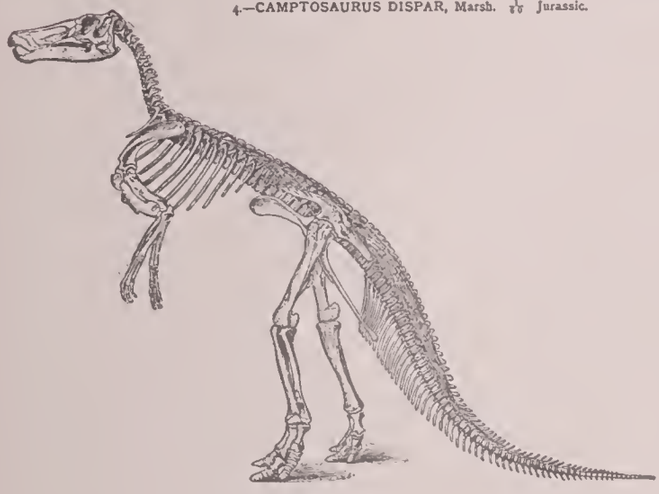


2.—BRONTOSAURUS EXCEL

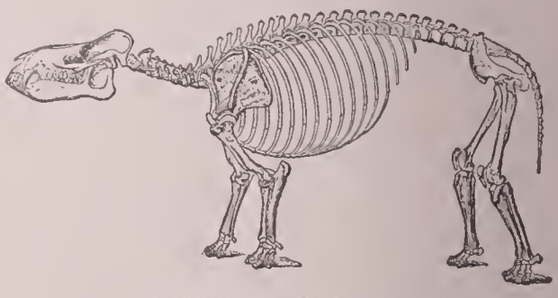


4.—CAMPTOSAURUS DISPAR, Marsh. $\frac{1}{30}$ Jurassic.

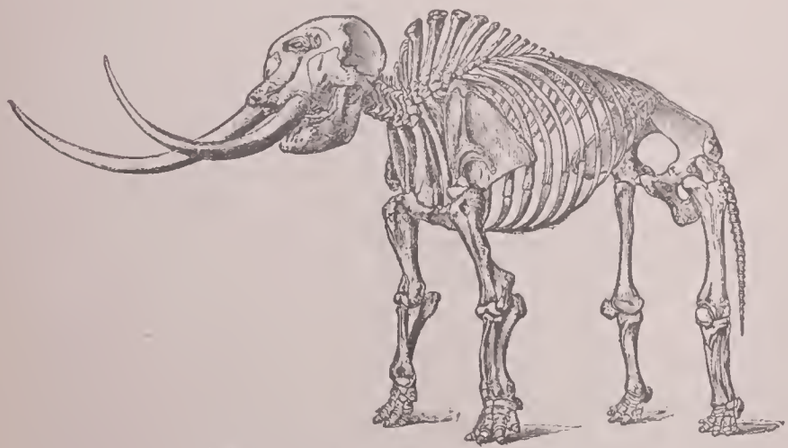
5.—STEGOSAURUS U



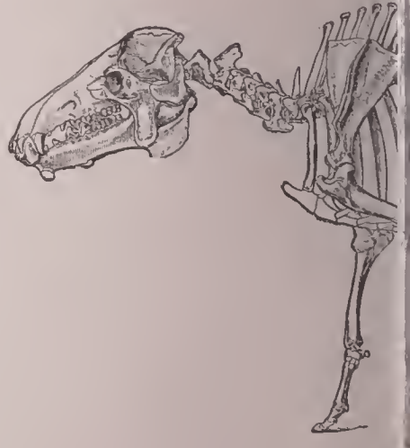
7.—CLAOSAURUS ANNECTENS, Marsh. $\frac{1}{30}$ Cretaceous.



12.—CORYPHODON HAMATUS, Marsh. $\frac{1}{30}$ Eocene.



16.—MASTODON AMERICANUS, Cuvier. $\frac{1}{24}$ Pleistocene.



15.—ENTELODON C

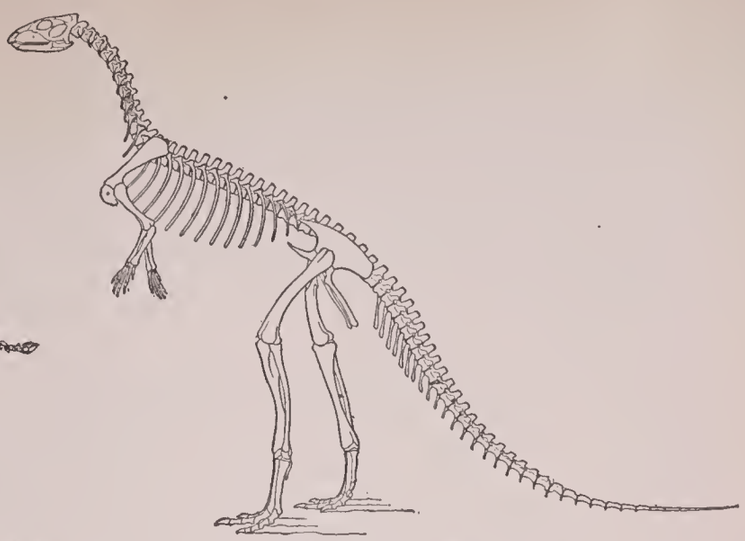
Restorations of Extinct Animals; by O. C

Copyright, 189

S, Marsh. $\frac{1}{12}$ Jurassic.

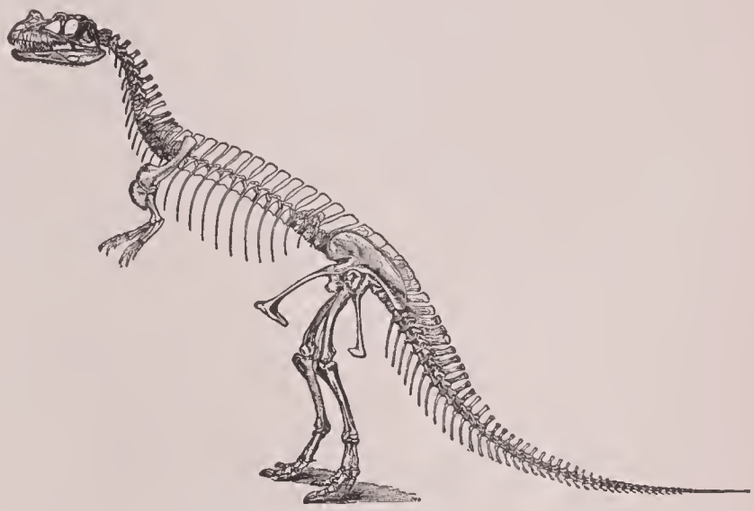
Marsh. $\frac{1}{180}$ Jurassic.

11.—ICHTHYORNIS VICTOR, Marsh. $\frac{1}{8}$ Cretaceous.

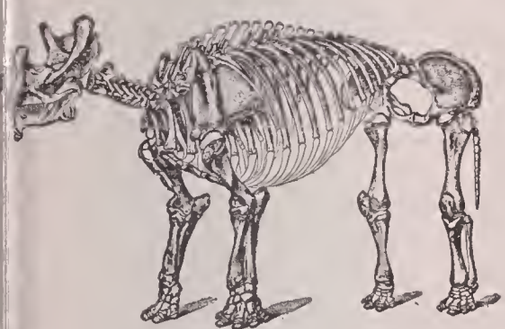


3.—LAOSAURUS CONSORS, Marsh. $\frac{1}{18}$ Jurassic.

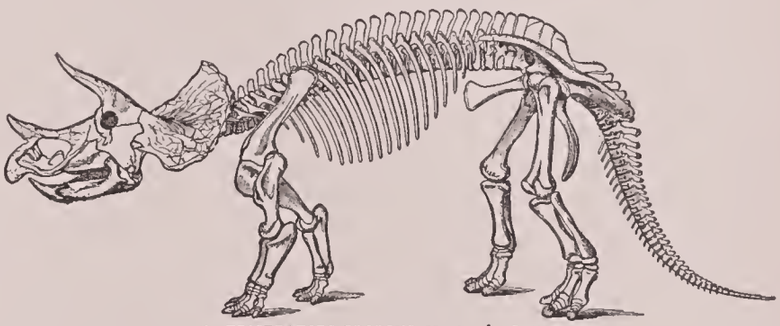
TUS, Marsh. $\frac{1}{10}$ Jurassic.



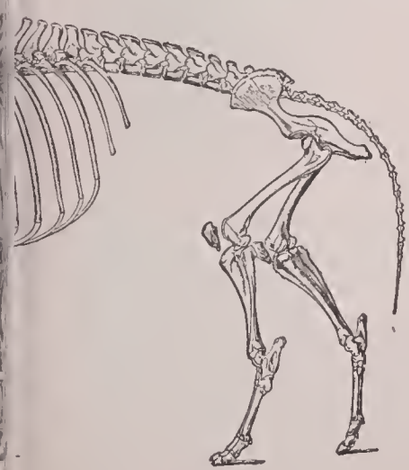
6.—CERATOSAURUS NASICORNIS, Marsh. $\frac{1}{10}$ Jurassic.



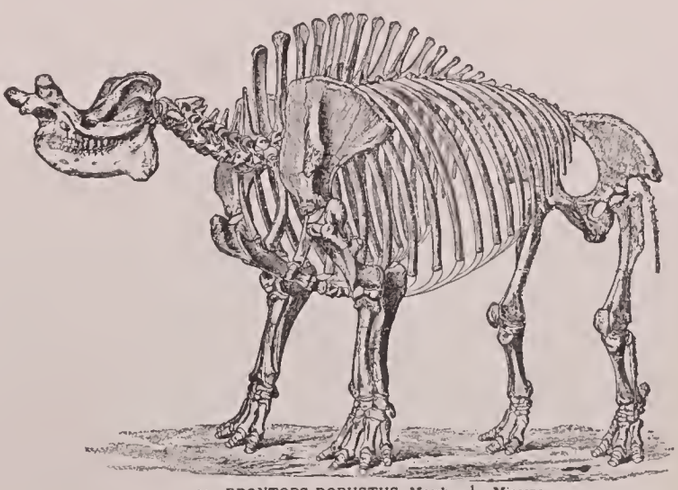
13.—TINOCERAS INGENS, Marsh. $\frac{1}{10}$ Eocene.



8.—TRICERATOPS PRORSUS, Marsh. $\frac{1}{80}$ Cretaceous.



, Marsh. $\frac{1}{12}$ Miocene.



14.—BRONTOPS ROBUSTUS, Marsh. $\frac{1}{18}$ Miocene.

rsh. — Original Specimens in Museum of Yale University.

Vertebrates, Fossil: the remains of vertebrate animals found in the geological formations of the earth.

The geological succession of vertebrate life, especially in America, deserves an important place, for without it as a foundation no clear idea can be obtained of ancient life itself. The recent discoveries in this department of biology in North America alone have been so extensive, and include so many new and interesting forms of animal life, that these will be mainly used as types to illustrate the subject, rather than those longer known from other parts of the world.

Another point of much importance, which can only be mentioned in the present statement, is the genetic relations of the various extinct vertebrates that have left their remains so abundantly in the successive strata of the earth. That the older forms are the ancestors of the later ones can be accepted as established, but in most series the exact lines of descent remain unknown. The progressive development of each group follows a certain law. The older forms are, as a rule, less specialized than their successors, and it is possible to determine with much certainty the approximate

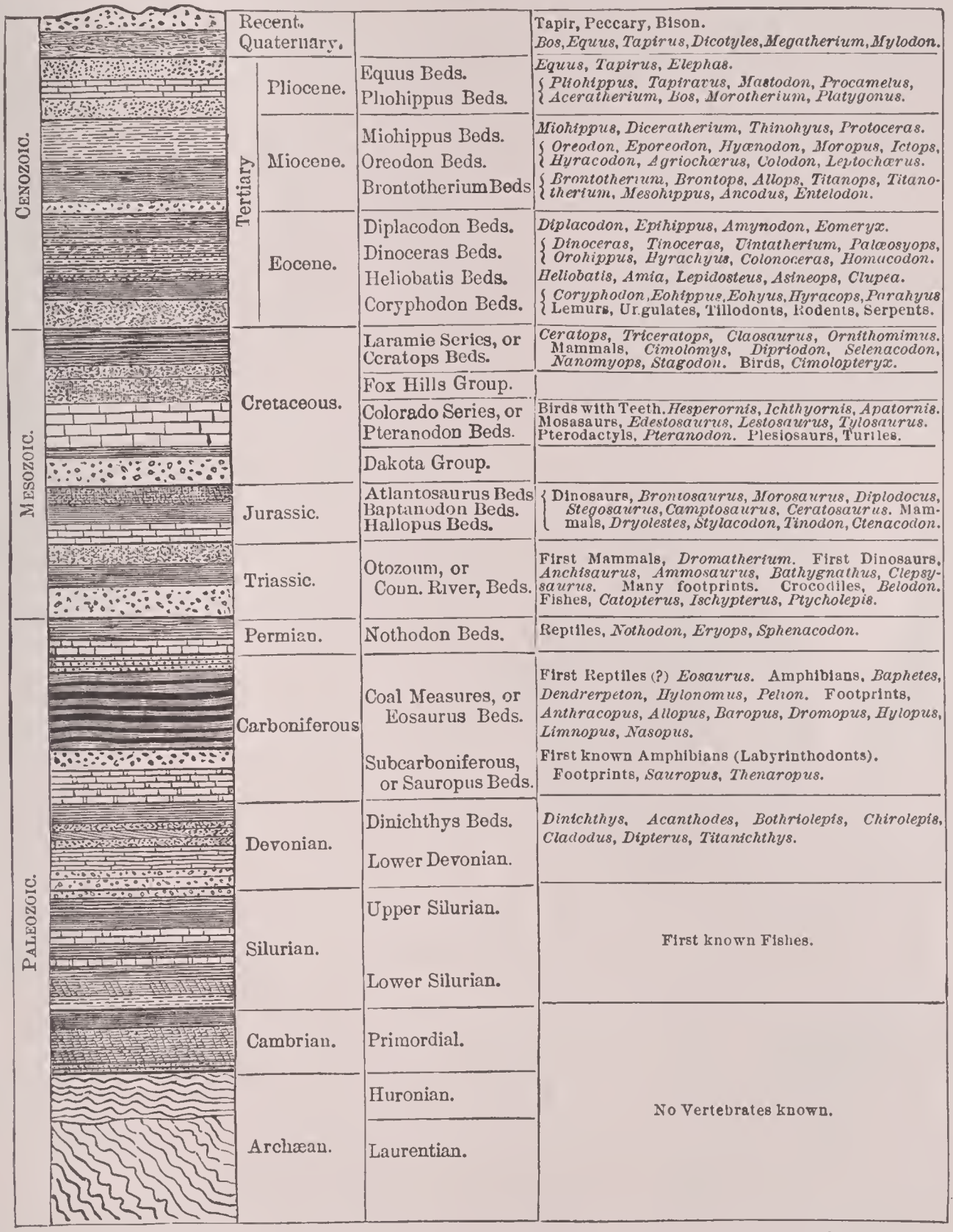


Fig. 1.—GEOLOGICAL HORIZONS OF VERTEBRATE FOSSILS IN NORTH AMERICA.

The diagram given above represents the principal geological horizons of vertebrate fossils in North America, as determined by the writer, and, if examined, will be found to be a synopsis of the subject. The first appearance, so far as known, of each important group of vertebrate animals may be approximately ascertained from the data given. Some of the succeeding genera of each group are also recorded, with the period in which they lived. The geological horizons of vertebrate life in other parts of the world have not been accurately determined, but some of the main divisions coincide in general with those here represented.

geological age of any vertebrate by the degree of modification it has undergone from the more primitive ancestral types. This is especially true of mammals, but can also be distinctly recognized in the other classes. Another fact that gives to vertebrate animals especial value in marking geological time is their high organization, which makes them more sensitive to climatic and other changes than invertebrates or plants, and thus their remains are better evidence in the determination of geological horizons. This general fact, now well established, has already proved of much service to both geologists and paleontologists.

Fishes.—No vertebrate life is known to have existed on the continent of North America in the Archæan or Cambrian periods, yet during this time half the thickness of American stratified rocks was deposited. It does not follow that vertebrate animals of some kind did not exist in those remote ages. Fishes are known from the Silurian of Europe and North America, and there is some probability that they will yet be discovered at a lower horizon. In the shore deposits of the early Devonian sea, characteristic remains of fishes were preserved, and in the deeper sea that followed, this class was well represented. During the remainder of the Devonian, fishes continue abundant, and, so far as now known, were the only type of vertebrate life. These fishes were mainly Ganoids, a group represented by the existing gar-pike and sturgeon, but in the Devonian sea chiefly by the Placoderms. With these were Elasmobranchs, or the shark tribe, and among them a few Chimæroids. The Placoderms were the monarchs of the ocean. All were well protected by a massive coat of armor, and some attained huge dimensions. The American Devonian fishes now known are not so numerous as those of Europe, but they were larger in size and mostly inhabitants of the open sea.

The more important genera of Placoderms are *Dinichthys*, *Aspidichthys*, and *Diplognathus*, the largest Palæozoic fishes. Others are *Acanthaspis*, *Acantholepis*, *Coccosteus*, and *Onychodus*. Among the Elasmobranchs were *Cladodus*, *Ctenacanthus*, *Rhynchodus*, and *Ptyctodus*, the last two being regarded as Chimæroids. The Dipterian family includes *Dipterus*, *Heliodus*, and possibly *Ceratodus*. Species of the European genera *Bothriolepis* and *Holoptychius* have likewise been found in America.

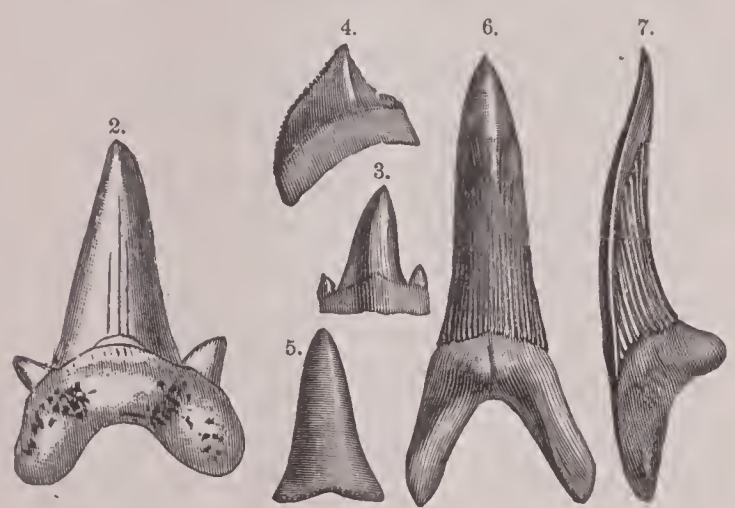


Fig. 2.—Tooth of *Otodus appendiculatus* (Agassiz).
Fig. 3.—Another tooth of same species.
Fig. 4.—Tooth of *Corax heterodon* (Reuss).
Fig. 5.—Tooth of *Oxyrhina mantelli* (Agassiz).
Fig. 6.—Tooth of *Lamna texana* (Rœmer); front view.
Fig. 7.—The same tooth; side view.
(2, after Gibbes; 3-7, after Rœmer.)

With the close of the Devonian came the almost total extinction of the great group of Placoderms, while the Elasmobranchs increase in numbers and size, and appear to be represented by sharks, rays, and Chimæras. Among the members of this group from the Carboniferous were numerous Cestracionts, species of *Cochliodus* of large size, with others of the genera *Deltodus*, *Helodus*, *Psammodus*, and *Sandalodus*. Of the Petalodonts, there were *Antliodus*, *Chomatodus*, and *Petalodus*; and of the Hybodonts, the genera *Cladodus*, *Carcharopsis*, and *Diplodus*. These Elasmobranchs were the rulers of the Carboniferous open sea. The Ganoids, although still abundant, were of smaller size, and lived in the more shallow waters. The latter group of fishes was represented by true *Lepidostidæ* of the genera *Palæoniscus*, *Amblypterus*, *Platysomus*, and *Eurylepis*. Other genera are *Rhizodus*, *Megalichthys*, *Ctenodus*, *Edestus*, *Orodus*, and *Ctenacanthus*. Most of these genera occur also in Europe.

In the Mesozoic age the fishes of North America begin to show a decided approach to those at present existing. From the Triassic rocks, Ganoids only are known, and they are all more or less closely related to the modern gar-pike, or *Lepidosteus*. They are small, and the number of individuals preserved is large. The characteristic genera are *Catopterus*, *Ischypterus*, *Ptycholepis*, and *Turseodus*. From the Jurassic deposits only a few remains of fishes are known, but in the Cretaceous ichthyic life assumed many and various forms, and the first of the Teleosts, or bony fishes, the characteristic fishes of the present, make their appearance. In the deep open sea of this age Elasmobranchs were the prevailing forms, sharks and Chimæroids being most numerous. In the inland Cretaceous sea of North America true osseous fishes were abundant, and among them were some of carnivorous habits and immense size. The sheltered bays and rivers were shared by the Ganoids and Teleosts, as their remains testify. The more common genera of Cretaceous Elasmobranchs were *Corax*, *Otodus*, *Oxyrhina*, *Galeocerdo*, *Lamna*, and *Ptychodus*. Among the osseous fishes, *Beryx*, *Enchodus*, *Portheus*, and *Saurocephalus* were especially common, while the most important genus of Ganoids was *Lepidotus*. The Tertiary fishes are nearly all of modern types, and from the beginning of this period there was little change. In the marine beds, sharks, rays, and Chimæroids maintained their supremacy, although Teleosts were abundant, and many of them of large size. The Ganoids were few in number. In the earliest Eocene fresh-water deposits the modern gar-pike and *Amia*, the dogfish of the Western lakes, which by their structure seem to be remnants of an early type, are represented by species so closely allied to them that only an anatomist could separate the ancient from the modern. In the succeeding beds these fishes are abundant, and with them are Siluroids, related to the modern catfish (*Pimelodus*). Many small fishes, allied apparently to the modern herring (*Clupea*), left their remains in great numbers in the same deposits, and with them a landlocked ray (*Heliobatis*).

The almost total absence of remains of fishes from the Miocene lake-basins of the West is a remarkable fact. These basins were probably so impregnated with mineral matters as to render the existence of vertebrate life impossible. In the Pliocene lake-basins of the same region remains of fishes are common. These are all of modern types, and many of them are Cyprinoids, related to the modern carp. The Post-Pliocene fishes are essentially those of to-day.

Amphibians.—The Amphibians, the next higher class of vertebrates, are so closely related to the fishes in structure that some peculiar forms of the latter have been considered as belonging to this group. The earliest evidence of Amphibian existence on the continent of North America is in the Subcarboniferous, where footprints have been found

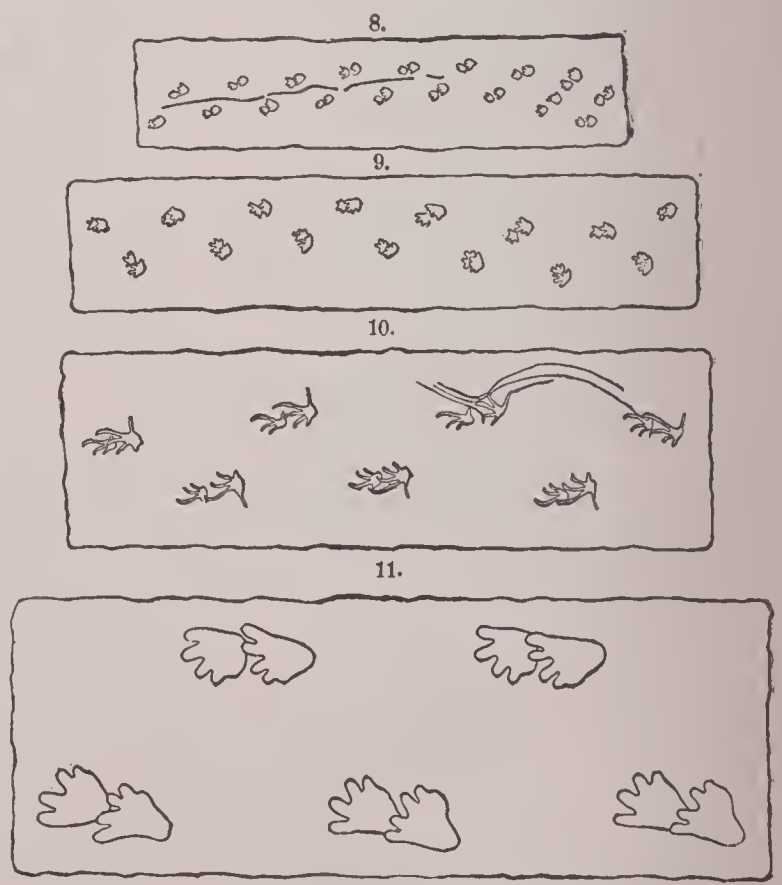


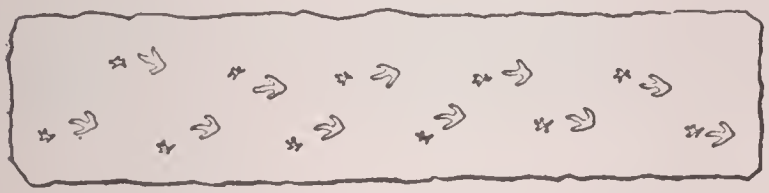
Fig. 8.—Footprints of *Nasopus caudatus* (Marsh).
Fig. 9.—The same of *Limnopus vagus* (Marsh).
Fig. 10.—The same of *Dromopus agilis* (Marsh).
Fig. 11.—The same of *Baropus lentus* (Marsh).
(All one-eighteenth natural size.)

which were probably made by Labyrinthodonts, the most ancient representatives of the class. Remains are abundant in the Coal Measures, and show that the Labyrinthodonts differed in important particulars from all modern Amphib-

ians, the group which includes frogs and salamanders. Some of these ancient animals resembled a salamander in shape, while others were serpent-like in form. None yet discovered was without a tail. All were protected by pectoral bony plates and an armor of small scutes on the ventral surface of the body. The walls of their teeth were more or less folded, whence the name Labyrinthodont. The American Amphibians known from osseous remains are all of moderate size, but the footprints attributed to this group indicate animals larger than any of the class yet found in the Old World. The Carboniferous Amphibians were abundant in the tropical forests of that period, and their remains have been found imbedded in the coal, as well as in hollow stumps of trees. The principal genera from American Carboniferous rocks are *Baphetes*, *Dendrerpeton*, *Hylonomus*, *Hylerpeton*, *Raniceps*, *Pelion*, *Leptophractus*, *Molgophis*, *Ptyonius*, *Amphibamus*, *Cocytinus*. Among the interesting forms known only from footprints are *Baropus*, *Dromopus*, *Nasopus*, and *Limnopus*. Some other genera known from fragmentary remains or footprints in this formation have likewise been referred with doubt to the true reptiles. In the Triassic, some remains of *Amphibia* have been found, but, although apparently all Labyrinthodonts, the specimens preserved are not sufficient to add to a knowledge of the group. The Triassic footprints which have been attributed to Amphibians are still more unsatisfactory. From the Jurassic and Cretaceous beds of North America a few remains of Amphibians are known. Some have also been found in the Tertiary, all of modern types.

Reptiles.—Reptiles form the next great division of vertebrates, and their extinct forms are of much interest. There is no evidence of the existence of this group in American rocks older than the Carboniferous; there is doubt in regard to their appearance even in this period. Various footprints which strongly resemble those made by lizards, a few well-preserved remains similar to the corresponding bones in that group, and a few characteristic specimens nearly identical with those from another order of this class, are known from American Coal Measures. In the Permian rocks of North America and of Europe true reptiles have been found. The

12.



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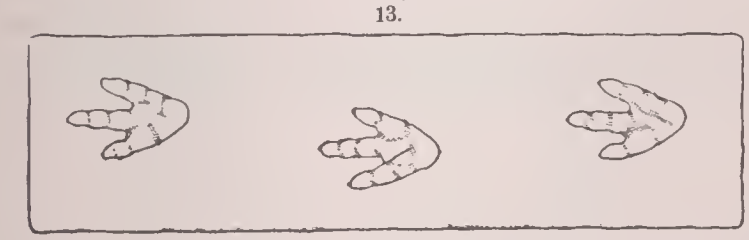

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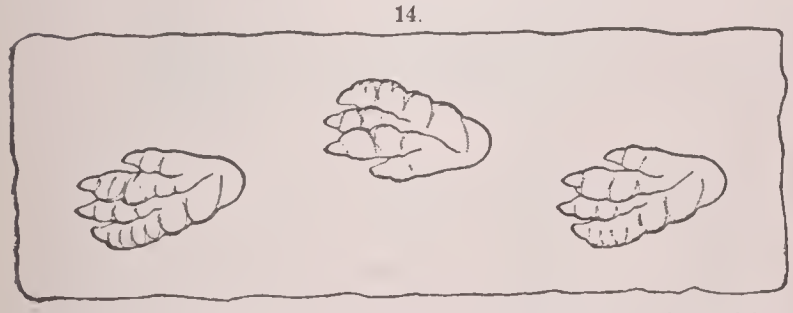

Fig. 12.—Footprints of small Dinosaur; showing impressions of fore and hind feet (one-twelfth natural size).
Fig. 13.—Footprints of large bipedal Dinosaur (*Brontozoum*, one-twenty-eighth natural size).
Fig. 14.—Footprints of large Dinosaur (*Otozoum*); showing impressions of hind feet alone (one-twenty-eighth natural size).

Mesozoic period has been called the Age of Reptiles, and during its continuance some of the strangest forms of reptilian life made their appearance and became extinct. Near its beginning, while the Triassic shales and sandstones were being deposited, true reptiles were abundant. Among the remains discovered are those of the genus *Belodon*, which is well known also in the Trias of Europe. It belongs to the division of reptiles which have teeth in distinct sockets, and its nearest affinities are with the *Crocodilia*, of which order it may be considered the oldest known representative.

In the same strata remains of Dinosaurs are found, and it is an interesting fact that these reptiles should make their appearance, even in a generalized form, at this stage of the earth's history. The Dinosaurs, true reptiles in all their more important characters, show certain points of resemblance to existing birds. During Triassic time, the Dinosaurs attained in America a great development, both in variety of forms and in size. Although few of their bones have been discovered in rocks, they have left unmistakable evidence of their presence in the footprints and other impressions upon the shores of the waters that they frequented. The Triassic sandstone of the Connecticut valley is famous for its fossil footprints, especially the so-called "bird-tracks," which were supposed to have been made by birds. A careful investigation proves that there is no evidence that any of these impressions were made by birds. Most of these three-toed tracks were certainly not made by birds, but by reptiles which usually walked upon their hind feet alone, and only occasionally put to the ground their smaller anterior extremities. These double impressions are precisely the kind which Dinosaurian reptiles would make.

15.

Fig. 15.—Skull of *Ceratosaurus nasicornis* (Marsh, one-twelfth natural size).

The principal genera of Triassic Dinosaurs known from osseous remains in North America are *Anchisaurus* and *Ammosaurus*, from the Connecticut valley; *Bathygnathus*, from Prince Edward island; and *Clepsysaurus*, from Pennsylvania. A restoration of *Anchisaurus* is shown in the accompanying plate, Fig. 1. In the Jurassic the Dinosaurs attained in North America a remarkable development, and appear to have reached their culmination. The *Theropoda*, or carnivorous forms, which were abundant but of moderate size in the Triassic, were represented in the Jurassic by many species, some minute and others of gigantic size. *Allosaurus*, *Ceratosaurus*, and *Hallopus* are among the genera of special interest, and *Compsognathus* and *Megalosaurus* in Europe. The restored skeleton of *Ceratosaurus* is given on the same plate, Fig. 6. The herbivorous Dinosaurs of this period, however, were the most remarkable of all, some surpassing in bulk any known land animals. Others of huge dimensions were clad in coats of mail, while others, diminutive in size and light and graceful of form, were so much like birds that only an anatomist could tell one from the other. The *Sauropoda* were the largest of all land animals, some reaching a length of from 60 to 80 feet. All the

a 16. *b* 17. 18.

Fig. 16.—Tooth of *Brontosaurus excelsus* (Marsh, natural size): *a*, outer view; *b*, end view.
Fig. 17.—Teeth of *Diplodocus longus* (Marsh, one-half natural size).
Fig. 18.—Tooth of *Camptosaurus medius* (Marsh, natural size).

known members of this group were quadrupedal, with the fore and hind limbs nearly equal in length. The head was very small and the neck long, with the vertebræ opisthocœlian and lightened by inner cavities, thus allowing free motion. The limb-bones were large and solid, and the feet

plantigrade, with five toes on each. The tail was especially long and massive. The general form and proportions are indicated in the accompanying plate, Fig. 2, which represents a skeleton of a species of *Brontosaurus*, a typical genus of the *Sauropoda*. Other American genera of this group are *Atlantosaurus*, *Apatosaurus*, *Diplodocus*, *Morosaurus*, and *Pleurocœlus*. Allied genera from Europe are *Cardiodon*, *Cetiosaurus*, *Ornithopsis*, and *Pelorosaurus*. One of the most remarkable of the herbivorous Dinosaurs that lived in Jurassic time was *Stegosaurus*, huge in size, with fore and hind limbs nearly equal in length, and all the bones of the skeleton solid. The animal was protected by a coat of armor, and the tail, armed with a series of enormous spines, was a powerful weapon of offense. A restoration of one species of this remarkable genus is shown in the same plate, Fig. 5. *Hylæosaurus*, *Omosaurus*, and *Scelidosaurus* are allied forms in Europe. Among the smaller bird-like Dinosaurs of this period were those belonging to the genera *Camptosaurus*, *Laosaurus*, and *Nanosaurus*, the last being about as large as a domestic fowl. Restorations of *Camptosaurus* and *Laosaurus* are represented in the plate, Figs. 3 and 4. *Iguanodon* and *Hypsilophodon* are corresponding genera in Europe. The Cretaceous Dinosaurs were nearly all of large size, and most of them walked on the hind feet alone, like modern struthious birds. Three well-marked types may be distinguished among the remains discovered in deposits of this age. The herbivorous forms are represented mainly by *Claosaurus*, a near ally of the *Iguanodon* of Europe; and by *Triceratops*, a gigantic horned reptile quite unlike any other animal known. Restorations of both are given in the accompanying plate, Figs. 7 and 8. Their carnivorous enemies were *Dryptosaurus* and *Ornithomimus*. No Dinosaurs are known from any strata later than the Cretaceous.

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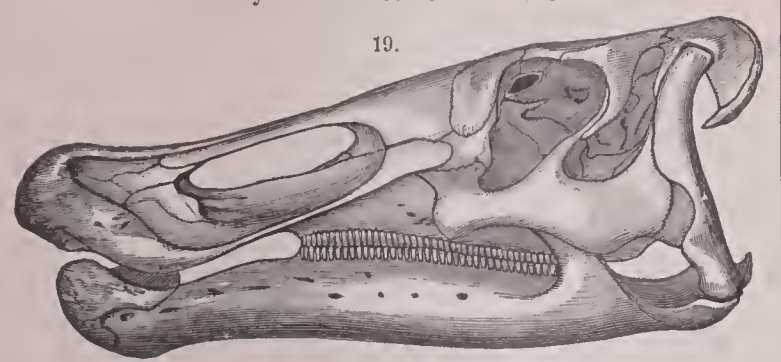

Fig. 19.—Skull of *Claosaurus annectens* (Marsh, one-fifteenth natural size).

A feature of the American Mesozoic fauna, as contrasted with that of Europe, is the almost entire absence of species of *Ichthyosaurus* and *Plesiosaurus*, which abound in many other regions, but in North America seem to be replaced by the Mosasaurs. A few remains have indeed been referred to these genera, but the determination may be questioned. The genus *Baptanodon*, from the American Jurassic, is essentially an Ichthyosaurian without teeth. The order *Plesiosauria* is well represented, but mainly by forms more nearly related to *Pliosaurus* than to the type of the group.

20. 21. 22. a b

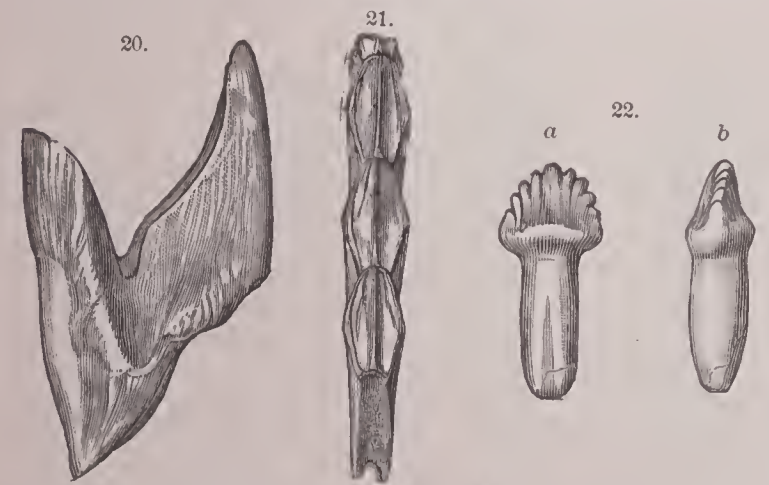

Fig. 20.—Tooth of *Triceratops serratus* (Marsh, natural size), showing two roots.
Fig. 21.—Series of teeth of *Claosaurus annectens* (Marsh, one-half natural size).
Fig. 22.—Tooth of *Stegosaurus ungulatus* (Marsh, twice natural size): *a*, outer view; *b*, end view.

These were marine reptiles, all of large size, while some of them attained vast dimensions. So far as at present identified, they may be referred to the genera *Cimoliosaurus*, *Discosaurus*, and *Pantosaurus*. The number of species is comparatively small, and none is known above the Cretaceous.

In the Jurassic strata of the Rocky Mountain region, remains of *Chelonia*, or turtles, make their first appearance. Some of the earliest forms are allied to the modern genus *Trionyx*, and the best-known genus is *Glyptops*. In the higher Cretaceous beds, some Chelonians of enormous size have been found. They belong to the genus *Atlantochelys*, which has the ribs separate as in the existing *Sphargis*. A few genera appear to be related to the modern genus *Chelone*. The remaining Cretaceous species were mostly of the Emydoid type, and others were related to *Chelydra*. The more important genera of Cretaceous Chelonians known from characteristic specimens are *Atlantochelys* (*Protostega*), *Adocus*, *Bothremys*, *Compsemys*, *Plastomenus*, *Osteopygis*, *Propleura*, *Lytoloma*, and *Taphrosphys*. Most of these genera were represented by several species, and the individuals were numerous. No land-tortoises have as yet been found in this formation. In American Tertiary deposits, Chelonians are abundant, especially in the fresh-water beds. They all show near affinities with modern types, and most of them can be referred to existing genera. In the Tertiary lake-basins of the West, land-tortoises are very numerous, and with them are many fresh-water forms of *Trionyx* and allied genera.

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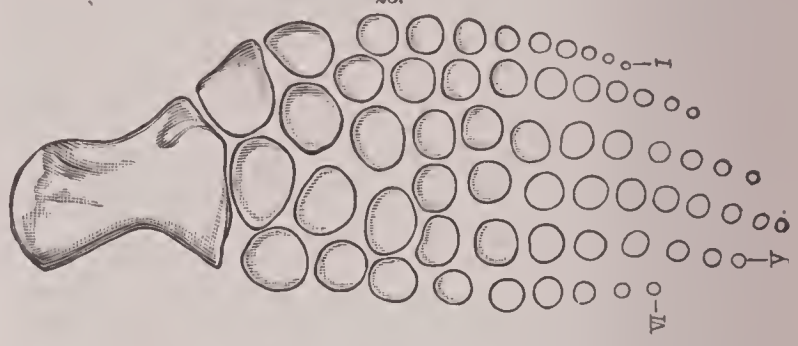

Fig. 23.—Left hind paddle of *Baptanodon discus* (Marsh, one-eighth natural size).

The reptiles most characteristic of American Cretaceous strata are the *Mosasauria*, a group with few representatives in other parts of the world. In the Cretaceous seas they ruled supreme, as their numbers, size, and carnivorous habits enabled them to easily vanquish all rivals. Some were

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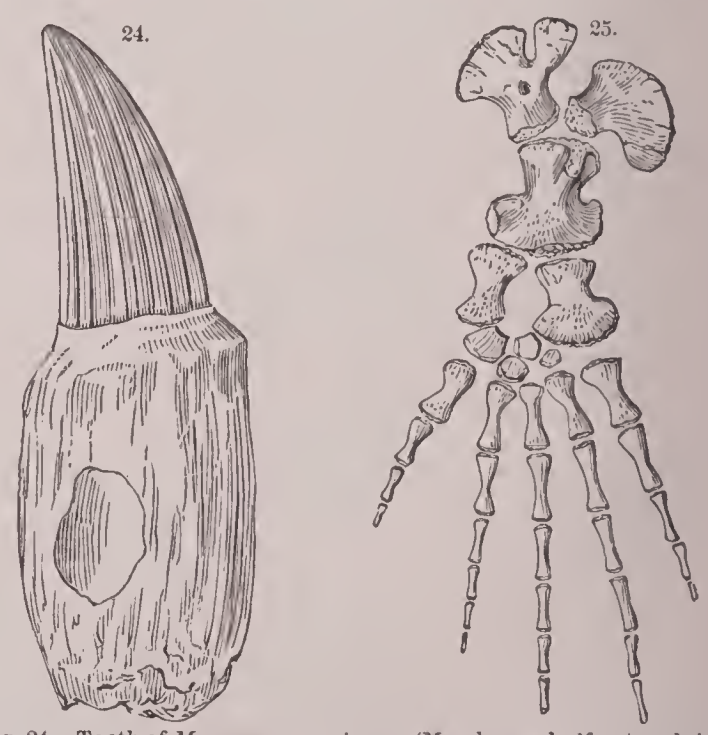

Fig. 24.—Tooth of *Mosasaurus princeps* (Marsh, one-half natural size).
Fig. 25.—Right paddle of *Lestosaurus simus* (Marsh, one-twelfth natural size).

at least 60 feet in length, and the smallest 10 or 12. The Mosasaurs were essentially swimming lizards, with four well-developed paddles, and they had little affinity with modern serpents, to which they have been compared. The species are quite numerous, but they belong to comparatively few genera, of which *Mosasaurus*, *Tylosaurus*, *Lestosaurus*, and *Edestosaurus* have alone been identified with certainty. The genus *Mosasaurus* was first found in Europe. All the known species of the group are Cretaceous.

The *Crocodilia* are abundant in rocks of Mesozoic age in America, and two distinct types are represented. The older type, which is foreshadowed by *Belodon* of the Trias, has biconcave vertebræ, and shows marked affinities with the genus *Teleosaurus*, from the Jura of Europe. The best-known genus is *Hyposaurus*, more or less resembling in form the modern gavial of the Ganges. The second type, which now makes its appearance for the first time, has procœlian vertebræ, and in other respects resembles existing crocodiles. The genera described are *Bottosaurus*, *Holops*, and *Thoracosaurus*, none of which, so far as known, passed above the Cretaceous. In the Eocene fresh-water beds of the West, Crocodilians are especially abundant, and all belong apparently to the genus *Crocodilus*, although some species show points of resemblance to existing alligators. The Miocene lake-basins of the same region contain no remains of crocodiles, so far as known, and the Pliocene deposits have afforded only a single species. The Tertiary marine beds of the Atlantic coast contain few Crocodilian remains, and all are of modern types, the genus *Gavialis* having one Eocene species, and the alligator being represented only in the later deposits.

True *Lacertilia*, or lizards, and a few serpents have been detected in American Cretaceous strata. In the Eocene lake-basins of Western North America, remains of lizards are numerous, and indicate species much larger than any now existing. Some of these, the *Glyptosauridæ*, were protected by a highly ornamented bony coat of mail, and others were covered with scales, like recent lizards. A few resembled, in their more important characters, the modern iguana. The genera best represented in the Eocene are *Glyptosaurus*, *Iguanavus*, *Oreosaurus*, *Thinosaurus*, *Tinosaurus*, and *Saniva*. Some of these genera appear to have continued into the Miocene, but here, as well as in the Pliocene, few remains of this group have been found.

The first American serpents, so far as now known, appear in the Laramie, where the genus *Coniophis* has recently been discovered. In the Eocene of the Atlantic border the genus *Titanophis* (*Dinophis*) is represented by several species of large size, one at least 30 feet in length, and all doubtless inhabitants of the sea. In the fresh-water Western Eocene, remains of snakes are abundant, but all are of moderate size. The largest of these were related to the modern boa-constrictors. The genera described are *Boavus*, *Lithophis*, and *Limnophis*. The Miocene and Pliocene snakes from the same region are known only from a few remains. The *Pterosauria*, or flying-lizards, are among the reptiles of Mesozoic time, and make their first appearance in the Jurassic. Many of them left their remains in the soft sediments of the inland Cretaceous sea. These were veritable dragons, having a spread of wings of from 10 to 25 feet. They differed from the smaller Pterodactyles found in the Old World, in the entire absence of teeth, showing in this respect a resemblance to modern birds; and they possessed other distinctive characters. They have therefore been placed by the writer in a new order, *Pteranodontia*, from the typical genus *Pteranodon*, of which five species are known. The only other genus is *Nyctosaurus*, represented by a single species. One of the European forms is shown in the plate, Fig. 9.

Birds.—The first known appearance of birds in America was during the Jurassic period, although announcements have been made of their existence in preceding epochs. *Laopteryx* is the oldest genus in North America, and *Archæopteryx* in Europe. The earliest American forms from the Cretaceous are the *Odontornithes*, or birds with teeth, which have been exhumed from the chalk of Kansas, and fully described by the writer. The two genera *Hesperornis* and *Ichthyornis* are types of distinct orders, and differ from each other and from *Archæopteryx* much more than do any existing birds among themselves.

Hesperornis was a large aquatic bird, nearly 6 feet in length, with a strange combination of characters. The jaws were provided with teeth, set in grooves; the wings were rudimentary and useless; while the legs were very similar to those of modern diving birds. *Ichthyornis*, a small flying bird, was stranger still, as the teeth were in sockets, and the vertebræ biconcave, as in fishes and a few reptiles. *Apatornis* and other allied forms occur in the same beds, and probably all were provided with teeth. It is strange that the companions of these ancient toothed birds should have been Pterodactyles without teeth. In the later Cretaceous beds of the Atlantic coast, remains of aquatic birds have been found, but all are apparently distinct from those of the West. The known genera of American Cretaceous birds are *Apatornis*, *Baptornis*, *Cimolopteryx*, *Coniornis*, *Graculavus*, *Hesperornis*, *Ichthyornis*, *Laornis*, *Lestornis*, *Palæotringa*, and *Telmatornis*. These are represented by some twenty species. In Europe, several species of Cretaceous birds are known, based upon fragmentary specimens. Restorations of the skeletons of *Hesperornis* and *Ichthyornis* are given in the plate, Figs. 10 and 11.

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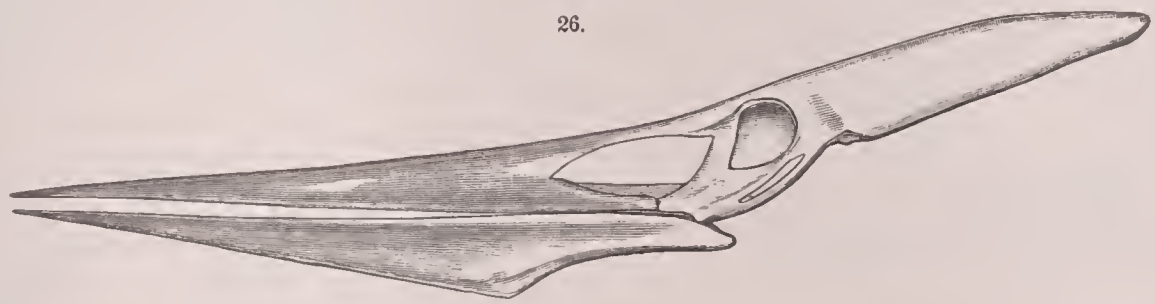

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Fig. 26.—Skull and lower jaw of *Pteranodon longiceps* (Marsh, one-eighth natural size).
Fig. 27.—Lower jaw of *Hesperornis regalis* (Marsh, one-half natural size).
Fig. 28.—Lower jaw of *Ichthyornis victor* (Marsh, twice natural size).

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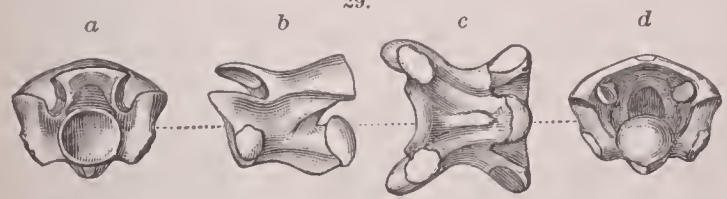

Fig. 29.—Vertebra of *Coniophis precedens* (Marsh, three times natural size): *a*, front view; *b*, side view; *c*, bottom view; *d*, back view.

During the Tertiary period birds were numerous in North America, and all discovered belong to modern types. The Eocene species described are mostly wading birds, but here, and in the later Tertiary deposits, some characteristic American forms make their appearance, strongly foreshadowing the present avian fauna. The extinct genera are the Eocene *Uintornis*, related to the woodpeckers, and *Aletornis*, which includes several species of waders. Among the existing genera found in Tertiary beds are *Aquila*, *Bubo*, *Meleagris*, *Grus*, *Graculus*, *Puffinus*, and *Catarractes*. The great auk (*Alca impennis*), once very abundant on the northeast coast, has become extinct.

Mammals.—The extinct mammals of North America are numerous, and present many and varied types. The oldest are from the Triassic, and the best representative now known belongs to the genus *Dromatherium*. In Europe and in South Africa a few remains have been found. In the Jurassic, mammalian life was probably abundant, as the number of specimens found in the West is quite large. All these fossils belonged to small animals of a low, primitive type, related to the existing Monotremes and Marsupials.

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FIG. 30.—Right lower jaw of *Dromatherium sylvestre* (Emmons, twice natural size). (After Marsh.)

The principal genera from the Jurassic of the U. S. are *Allodon*, *Asthenodon*, *Ctenacodon*, *Diplocynodon*, *Dryolestes*, *Menacodon*, *Laodon*, *Priacodon*, *Stylacodon*, and *Tinodon*. Allied genera from Europe are *Amphilestes*, *Bolodon*, *Peramus*, *Phascolotherium*, *Plagiaulax*, *Stylodon*, and *Stereognathus*.

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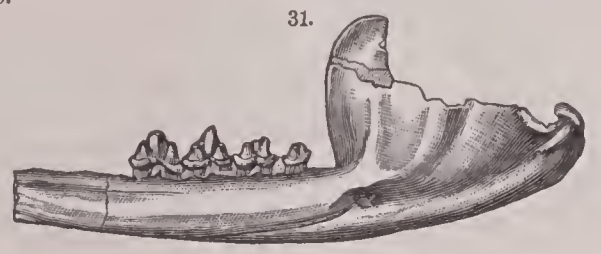

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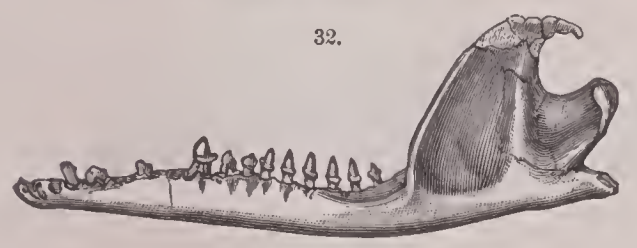

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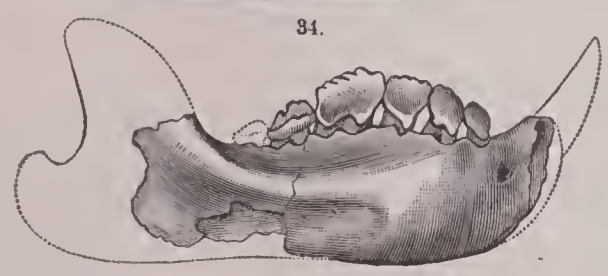

FIG. 31.—Right lower jaw of *Tinodon bellus* (Marsh, three times natural size).
FIG. 32.—Left lower jaw of *Stylacodon gracilis* (Marsh, three times natural size).
FIG. 33.—Left lower jaw of *Laodon venustus* (Marsh, four times natural size).
FIG. 34.—Right lower jaw of *Ctenacodon serratus* (Marsh, four times natural size).

The Cretaceous mammals now known from North America are small and low in type, but show some advance over those from the lower formations. The principal genera are as follows: *Allacodon*, *Camptomus*, *Cimolestes*, *Cimolomys*, *Batodon*, *Didelphops*, *Dipriodon*, *Halodon*, *Oracodon*, *Nanomyops*, *Selenacodon*, *Stagodon*, *Telacodon*, and *Triprio-don*. From the Cretaceous of Europe only a few fragments of mammals are known.

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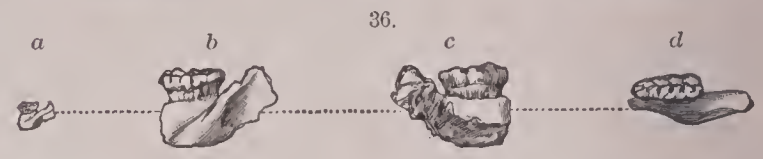

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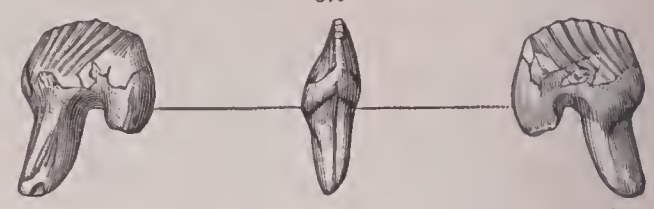

FIG. 35.—Upper jaw of *Allacodon pumilus* (Marsh, three times natural size): *a*, seen from below; *b*, end view; *c*, side view.
FIG. 36.—Lower jaw of *Cimolodon agilis* (Marsh—*a*, natural size; *b*, *c*, *d*, three times natural size).
FIG. 37.—Fourth lower premolar of *Halodon sculptus* (Marsh, twice natural size).

In the lowest Tertiary beds of North America a rich mammalian fauna makes its appearance, and, from that time through the age of mammals to the present, America has been constantly occupied by this type of life in the greatest diversity of form. A nearly continuous record of this life is now accessible, and insures great additions to a knowledge of the genealogy of mammals, and perhaps the solution of more profound problems. One family, the *Coryphodontidæ*, well represented at this horizon both in America and Europe, possesses some characters which point to a

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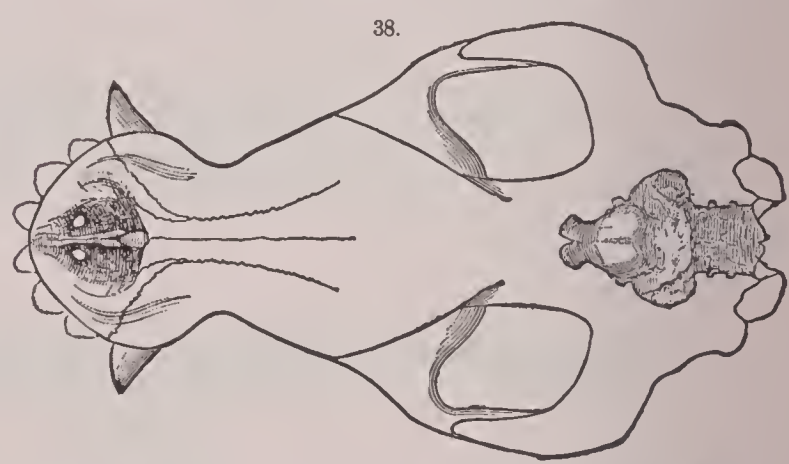

FIG. 38.—Skull, with brain-cast, of *Coryphodon hamatus* (Marsh, one-sixth natural size).

primitive Ungulate type from which the present orders have been evolved. Among these characters are the diminutive brain, which in size and form approaches that of the reptiles, and also the five-toed feet, from which all the forms of the mammalian foot have been derived. Of this family, only a single genus, *Coryphodon*, is known, but there are several species. They were the largest mammals of the lower Eocene. In the middle Eocene, W. of the Rocky Mountains, a remarkable group of Ungulates makes its appearance. These animals nearly equaled the elephant in size, but had shorter limbs. The skull was armed with two or three pairs of horn-cores, and with enormous canine tusks. The brain was proportionally smaller than in any other land mammal. The feet had five toes, and in their general structure were like those of *Coryphodon*, thus indicating an affinity with that genus. These mammals resemble in some respects the Perissodactyles, and in others the Proboscidians, yet differ so widely from any known Ungulates, recent or fossil, that they must be regarded as a distinct order, the *Dinocerata*. Only three genera are known, *Dinoceras*, *Tinoceras*, and *Uintatherium*, but a number of species have been described. During the later part of the middle Eocene these animals were abundant, and then became extinct, leaving apparently no successor, unless the Proboscidians are their much-modified descendants. Restorations of *Coryphodon* and *Tinoceras* are shown in the accompanying plate, Figs. 12 and 13.

The oldest representative of the horse at present known is the diminutive *Eohippus*, from the lower Eocene. Sev-

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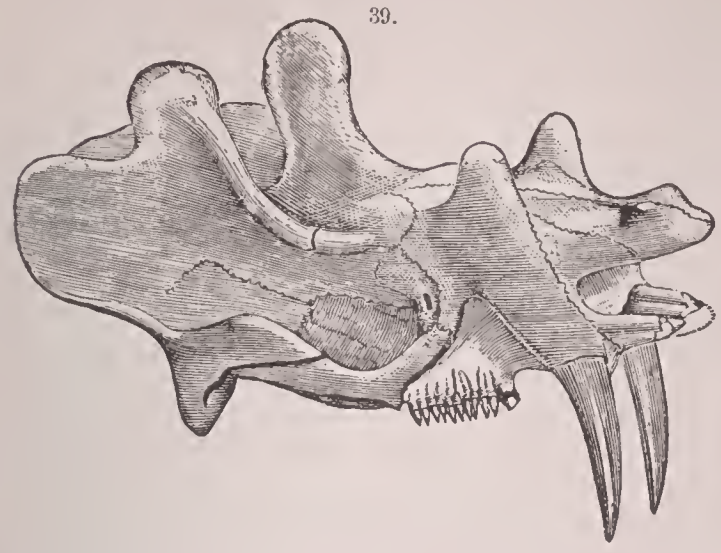

FIG. 39.—Skull of *Dinoceras mirabile* (Marsh, one-tenth natural size).

eral species have been found, all about the size of a rabbit. Like most of the early mammals, these Ungulates had forty-four teeth, the molars with short crowns, and quite distinct in form from the premolars. The ulna and the fibula were entire and separate, and there were four well-developed toes and a rudiment of another on the fore feet, and three toes behind. In the structure of the feet, and in the teeth, the *Eohippus* indicates unmistakably that the direct ancestral line to the modern horse has already separated from the other Perissodactyles. In the next higher division of the Eocene, another genus, *Orohippus*, about as large as a fox, makes its appearance, replacing *Eohippus*, and showing a greater resemblance to the equine type. The rudimentary

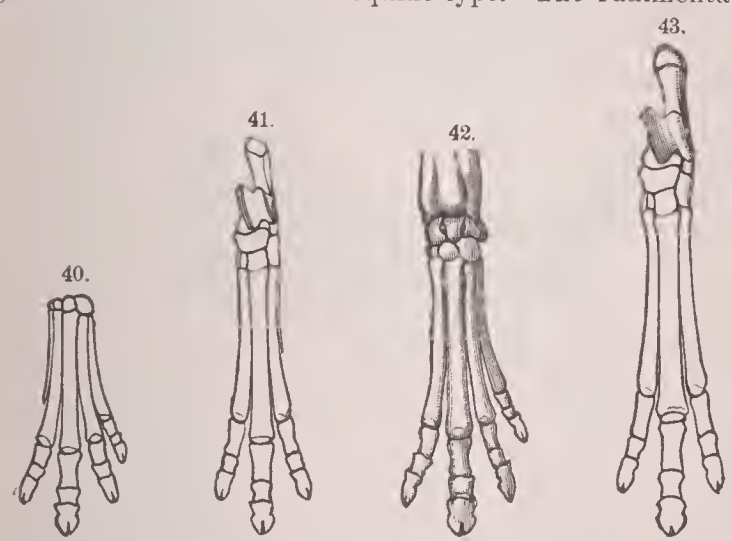

FIG. 40.—Left fore foot of *Eohippus pernix* (Marsh).
FIG. 41.—Left hind foot of same.
FIG. 42.—Left fore foot of *Orohippus agilis* (Marsh).
FIG. 43.—Left hind foot of same.
(All two-thirds natural size).

first digit of the fore foot has disappeared, and the last premolar has gone over to the molar series. *Orohippus* was little larger than *Eohippus*, and in most respects very similar. Several species have been found in the same horizon with *Dinoceras*. In the upper Eocene, with *Diplacodon*, another equine genus, *Epihippus*, has been found, nearly related to *Orohippus*, but more specialized.

Near the base of the Miocene, in the Brontotherium beds, is a third genus, *Mesohippus*, about as large as a sheep, and one stage nearer the horse. There are only three toes and a rudimentary splint bone in the fore feet, and three toes behind. Two of the premolar teeth are quite like the molars. The ulna is no longer distinct, or the fibula entire, and other characters show clearly that the transition is advancing. In the upper Miocene a fourth form, *Miohippus*, continues the line. This genus is near the *Anchitherium* of Europe, but presents several differences. The three toes in each foot are more nearly of a size, and a rudiment of the fifth metacarpal bone is retained. All the species of this genus are larger than those of *Mesohippus*, and none passed above the Miocene. The genus *Protohippus*, of the lower Pliocene, is yet more equine, and some of its species equaled the ass in size. There are still three toes on each foot, but only the middle one, corresponding to the single toe of the horse, comes to the ground. This genus resembles most nearly the *Hipparion* of Europe. In the Pliocene is the last stage of the series before reaching the horse—the genus *Pliohippus*, which has lost the small hooflets, and in other respects is very equine. Only in the upper Pliocene does the true *Equus* appear, and complete the genealogy of the horse, which in the Post-Tertiary roamed over the whole of North and South America, and soon after became extinct. Besides the horse and his congeners, the only existing Perissodactyles are the rhinoceros and tapir. The latter is the older type, but the rhinoceros had near allies throughout the Tertiary.

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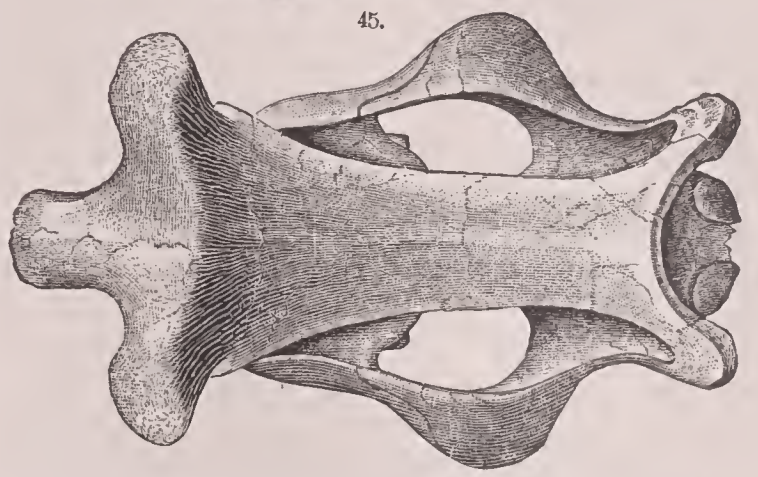

FIG. 44.—Skull of *Brontotherium ingens* (Marsh, one-twelfth natural size).
FIG. 45.—The same skull; top view.

At the bottom of the Eocene, in the Western lake-basins of the U. S., the tapiroid genus *Helaletes* is found, represented by numerous small mammals hardly larger than the diminutive horses of that day. In the following epoch of the Eocene the closely allied *Hyrachyus* was one of the abundant animals. This genus was nearly related to the *Lophiodon* of Europe, and in its teeth and skeleton strongly resembled the living tapir, whose ancestry, to this point, seems to coincide with that of the rhinoceros. Strangely enough, the rhinoceros line, before it becomes distinct, separates into two branches. In the upper part of the Dino-

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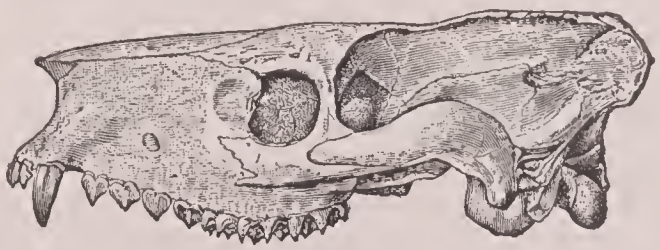

FIG. 46.—Skull of *Eporeodon major* (Leidy, one-fourth natural size). (After Marsh.)

ceras beds occurs the genus *Colonoceras*, which is really a *Hyrachyus* with a transverse pair of very rudimentary horn-cores on the nasal bones. In the lower Miocene W. of the Rocky Mountains, this line seems to pass on through the genus *Diceratherium*, and in the higher Miocene this genus is well represented. Some of the species nearly equaled in size the existing rhinoceros, which *Diceratherium* strongly resembled. The main difference between them is a most interesting one. The rudimentary horn-cores on the nasals, seen in *Colonoceras*, are in *Diceratherium* developed into strong bony supports for horns, which were placed transversely, as in the ruminants, and not on the median line, as in all existing forms of rhinoceros.

Among the large mammals in the lower Eocene is *Limnohyus*, a true Perissodactyle. In the next higher beds this genus is well represented, and with it is found a nearly allied form, *Palæosyops*. In the upper Eocene both have left the field, and the genus *Diplacodon*, a very near relative, holds the supremacy. The line seems clear through these three genera, but on crossing the break into the Miocene, there are apparently, as next of kin, the huge *Brontotheridæ*. These strange beasts show in their dentition and other characters the same transition steps beyond the *Diplacodon* which that genus had made beyond *Palæosyops*. The *Brontotheridæ* were nearly as large as the elephant, but had shorter limbs. The skull was elongated, and had a transverse pair of large horn-cores on the maxillaries, in front of the orbits, like the middle pair in *Dinoceras*. There were four toes in front and three behind, and the feet were similar to those of the rhinoceros. There are several genera in this group, *Brontotherium*, *Brontops*, *Allops*, *Titanotherium*, and *Megacerops*, which have been found only in the lowest Miocene, E. of the Rocky Mountains. A restoration of *Brontops* is given in the plate, Fig. 14. In the other branch of the rhinoceros group, which left their remains mainly E. of the Rocky Mountains, all the known forms are hornless. The upper Eocene genus, *Amynodon*, is the oldest known rhinoceros, and by far the most generalized of the family. The premolars are all unlike the molars; the four canines are of large size, but the inner incisor in each jaw is lost in the fully adult animal. The nasals were without horns. There were four toes in front and three behind. The genus *Hyracodon*, of the Miocene, which is essentially a rhinoceros, has a full set of incisor and canine teeth. In the higher Miocene beds occurs a larger rhinoceros, which has been referred to the genus *Aceratherium*. This form has lost the canine and one incisor above, and two incisors below. In the Pliocene are several species closely related, and of large size. Above the Pliocene in America no vestiges of the rhinoceros have been found.

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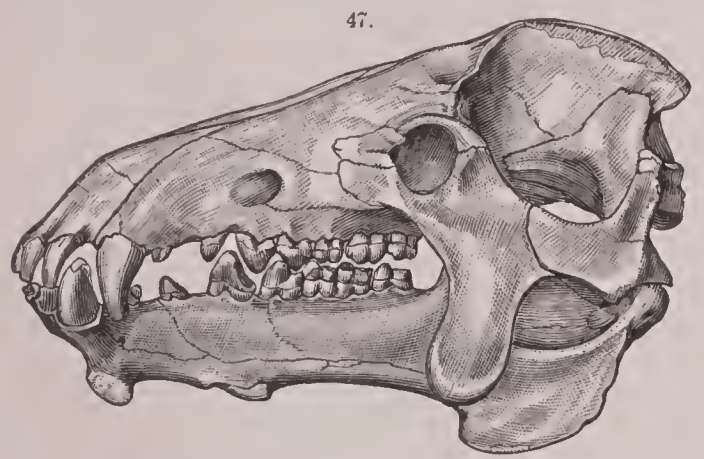

FIG. 47.—Skull of *Entelodon crassus* (Marsh, one-eighth natural size).

The Artiodactyles, or even-toed Ungulates, are the most abundant of the larger mammals now living; and the group dates back at least to the lowest Eocene. Of the two well-marked divisions of this order, the Bunodonts and the Selenodonts, the former is the older type. In the Coryphodon beds of New Mexico occurs the oldest Artiodactyle yet found, but it is known only from fragmentary specimens. These remains are Suilline in character, and belong to the genus *Eohyus*. In the beds above, the genus *Helohyus* is not uncommon, and several species are known. *Homacodon* is an allied genus from the middle Eocene. In the upper Eocene the true Selenodonts appear in the genera *Eomeryx*, *Hyomeryx*, *Oromeryx*, and *Parameryx*. In the Miocene, *Oreodon*, *Eporeodon*, *Entelodon*, and *Thinohyus* are important genera. The skeleton of one species of *Entelodon* is shown on the accompanying plate, Fig. 15.

The Proboscidians make their appearance in North America in the lower Pliocene, where several species of *Mastodon* have been found. A restoration of one species of this genus is shown on the same plate, Fig. 16. (See also the article MASTODON.) This genus occurs also in the upper Pliocene and in the Post-Tertiary; although some of the remains attributed to the latter are undoubtedly older. The Pliocene species have a band of enamel on the tusks, and other peculiarities observed in the oldest mastodons of Europe, which are from essentially the same horizon. Two species of this genus have been found in South America, in connection with the remains of extinct llamas and horses. The genus *Elephas* is a later form, and has not yet been identified in North America below the upper Pliocene, where one gigantic species was abundant. In the Post-Pliocene remains of this genus are numerous. The hairy mammoth of the Old World (*Elephas primigenius*) was once abundant in Alaska.

Perhaps the most remarkable mammals as yet found in America are the *Tillodontia*, which are comparatively abundant in the lower and middle Eocene. These animals seem to combine the characters of several different groups, viz., the Carnivores, Ungulates, and Rodents. In the genus *Tillotherium*, the type of the order and of the family *Tillotheridæ*, the skull resembles that of the bears; the molar teeth are of the ungulate type, while the large incisors are similar to those of Rodents. The skeleton resembles that of the Carnivores, but the scaphoid and lunar bones are distinct, and there is a third trochanter on the femur. The feet are plantigrade, and each had five digits, all with long, pointed claws. In the allied genus *Stylinodon*, which belongs to a distinct family, the *Stylinodontidæ*, all the teeth were rootless. Some of these animals were as large as a tapir. The genus *Dryptodon* has been found only in the Coryphodon beds of New Mexico, while *Tillotherium* and *Stylinodon* occur in the middle Eocene of Wyoming. The order *Toxodontia* includes two genera, *Toxodon* and *Nesodon*, which have been found in the Post-Tertiary deposits of South America. These animals were huge, and possessed such mixed characters that their affinities are a matter of considerable doubt. They are believed to be related to the Ungulates, Rodents, and Edentates.

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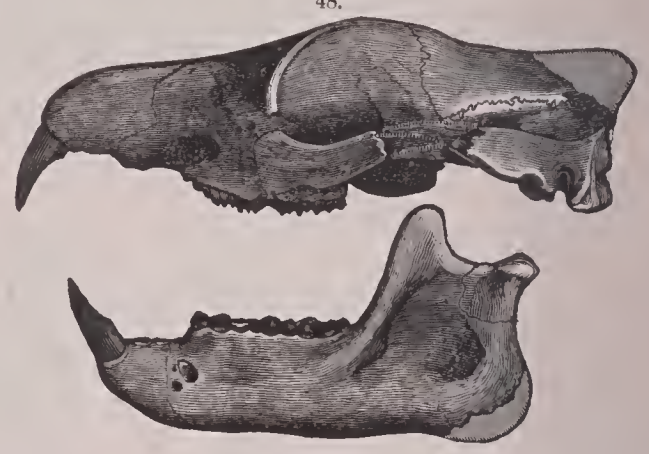

FIG. 48.—Skull of *Tillotherium fodiens* (Marsh, one-sixth natural size).

In the lower Eocene of New Mexico are representatives of the earliest known Primates, and among them are the genera *Lemuravus* and *Limnotherium*, each the type of a distinct family. These genera became abundant in the middle Eocene of the West, and with them are found others—all included in the two families *Lemuravidæ* and *Limnotheridæ*. *Lemuravus* appears to have been nearly allied to the lemurs, and is the most generalized form of the Primates yet discovered. It had forty-four teeth, forming a continuous series above and below. The brain was nearly smooth, and of moderate size. The skeleton most resembles that of the lemurs. An allied genus, belonging to the same family, is *Hyopsodus*. *Limnotherium* also is nearly related to the lemurs, but shows some affinities with the South American marmosets. This genus had forty teeth. The brain was nearly smooth, and the cerebellum large, and placed mainly behind the cerebrum. The orbits are open behind, and the lachrymal foramen is outside the orbit. Other genera belonging to the *Limnotheridæ* are *Notharctos*, *Hipposyus*, *Microsyops*, *Palæacodon*, *Thinolestes*, and *Telmatolestes*. Besides these, *Antiacodon*, *Bathrodon*, and *Mesacodon* should be placed in the same group. All the Eocene Primates known from American strata are low generalized forms, with characters in the teeth, skeleton, and feet that suggest relationships with the Carnivores, and even with the Ungulates. In the Post-Pliocene deposits of the Brazilian caves, remains of monkeys are numerous, and belong to extinct species of *Callithrix*, *Cebus*, and *Jacchus*, all living South American genera. Only one extinct genus, *Protopithecus*, which embraced animals of large size, has been found in this peculiar fauna. It is a noteworthy fact that no traces of any Anthropoid apes, or of any Old World monkeys, have yet been found in America. O. C. MARSH.

Vertigo [Mod. Lat., from Lat. *verti'go*, whirling, dizziness, giddiness, deriv. of *ver'tere*, turn, whirl]: a subjective or apparent impairment of the equilibrium of the body. It assumes two principal forms: in one it appears to the subject as if the objects in his vicinity were whirling about him; in the other, he fancies that he is forced to fall in some definite direction, forward, backward, or to either side. Vertigo is rarely if ever continuous, but occurs in paroxysms provoked by some appreciable cause, as changing posture, eating, using the eyes, etc. The subjects of vertigo often stagger or fall in consequence of the sensation of motion. Vertigo is sometimes the expression of disease of the brain, or of interference with the circulation of blood in that organ, but more usually it is a sympathetic disorder, caused by indigestion, anæmia, sudden impairment of parallelism between the two eyes, disease of the internal organs of hearing, etc. Vertigo may be artificially produced by the administration of stimulants (alcohol) and by the application of galvanism to the head in a transverse direction or to the superior ganglion of the cervical sympathetic nerve. A variety of subjective unsteadiness, without definite direction to the apparent movement, is better designated as dizziness. Vertigo is not a disease, but a condition common to a number of diseases. Revised by WILLIAM PEPPER.

Vertot d'Auboeuf, vär'tō'dō'böf', RENÉ AUBERT, de: historian; b. at the château of Benetot, department of Eure, France, Nov. 25, 1655; became first a Capuchin, then a Premonstratensian monk, and was appointed secretary to the general of the latter order, but resigned this position afterward and became a secular priest in the neighborhood of Rouen; published in 1689 *Histoire des Révolutions de Portugal*, which attracted much attention, and in 1696 *Histoire des Révolutions de Suède* (2 vols.), which also proved a success; was elected a member of the Academy of Inscriptions in 1701; removed to Paris; published in 1719 *Histoire des Révolutions dans le Gouvernement de la République romaine* (3 vols.); became historiographer of the Knights of St. John, and received access to their archives; published in 1726 *Histoire des Chevaliers de St. Jean de Jérusalem* (4 vols.). D. in Paris, June 15, 1735. His first work is distinguished by a fluent and elegant style, the last rests on actual study of sources, but none of his works combines these qualities. F. M. COLBY.

Vertue, GEORGE: engraver and antiquary; b. in Westminster, England, in 1684; enjoyed the favor of Sir Godfrey Kneller and the patronage of Lord Somers and other wealthy nobles; was an original member of the Academy of Painting 1711; became engraver to the Society of Antiquaries 1717; made many journeys through England during forty years, taking drawings of churches, monuments, and ruins as materials for an intended history of the fine arts in England, for which he accumulated 13 folio vols. of MSS.; was a strict Roman Catholic and a man of singular piety, modesty, and artistic conscientiousness. D. in London, July 24, 1756, and was buried in Westminster Abbey. Among his best-known works are sets of twelve *Portraits of Poets* (1730), ten *Portraits of Charles I. and his Friends*, and the series of Kings of England in Rapin's *History*. His extensive materials fell into the hands of Horace Walpole, and a portion of them were published by him as *Anecdotes of Painting in England*, etc. (Strawberry Hill, 5 vols. 4to, 1762–71), to which was appended his *Catalogue of Engravers who have been Born or Resided in England*. The latter work was separately published, with an *Account* of Vertue's life and works (Strawberry Hill, 1763), by Walpole.
Revised by RUSSELL STURGIS.

Vertum'nus, or **Vortumnus** [Lat., deriv. of *ver'tere*, turn, change]: in Roman mythology, the god of the seasons, and, as the husband of Pomona, more especially the god of fruit. He was of genuine Italian origin. A feast, *Vertumnalia*, was celebrated in his honor on Aug. 23. By artists he was generally represented as resembling Saturn.

Verulam, BARON: See BACON, FRANCIS.

Verus, LUCIUS: See ANTONINUS, MARCUS AURELIUS.

Vervain: See VERBENA FAMILY.

Verviers, vär'vi-ā': town; province of Liège, Belgium; on the Vesdre; 15 miles by rail E. S. E. of Liège (see map of Holland and Belgium, ref. 11–H). It is the center of a cloth-manufacturing industry which employs most of the people in the city and adjacent district; there are also some machine-shops. The town has a public library and a picture-gallery. Pop. (1891) 48,907.

Very, JONES: poet; b. at Salem, Mass., Aug. 28, 1813; made several voyages to Europe with his father, who was a sea-captain; graduated at Harvard 1836; was Greek tutor there 1836–38; published a volume of *Essays and Poems* (1839); was licensed as a preacher by the Cambridge (Unitarian) association 1843, but never held a pastoral charge, and lived a retired life at Salem, occasionally contributing to the Salem *Gazette* and to the religious organs of his denomination. D. at Salem, May 8, 1880. Posthumous editions of his *Poems* were published in 1883 and 1886, with memoirs of the author. His religious sonnets are marked by great spiritual refinement and depth of feeling.
Revised by H. A. BEERS.

Vesa'lius, ANDREAS: anatomist; b. in Brussels, Belgium, Dec. 31, 1514; studied medicine at Louvain, Cologne, Montpellier, and Paris; lectured on anatomy at Basel, Pavia, Bologna, and Pisa; was surgeon to the imperial army in Netherlands; was appointed physician to Charles V. in 1544, and afterward to Philip II.; was accused of heresy by the Spanish Inquisition and condemned to death, but the sentence was commuted to a pilgrimage, and in 1563 he went to the Holy Land, returning from which he suffered shipwreck at Zante, and died from starvation Oct. 15, 1564. His *De Corporis Humani Fabrica* first appeared at Basel in 1543, and formed the foundation of the modern science of anatomy. It rests on actual observations made by dissection of the human body, and was received with the fiercest opposition by the Galenian school, who derived all their knowledge from dissections of the lower animals. His complete works appeared in two folio volumes at Leyden in 1725. See the monograph by Roth (Basel, 1886).

Ve'sicants [from Lat. *vesi'ca*, blister]: in medicine, agents that produce blistering. Very many local irritants are capable of raising a blister, but many of these are too harsh and violent for medicinal use. For the ordinary purposes of blistering a preparation of cantharides (see CANTHARIS) is commonly used; but where haste is urgent, cotton soaked in ammonia water may be employed or a hot iron momentarily applied to the skin. Both these means produce a blister, but they are painful and may cause severe inflammation, and are used only where a small blister is desired. Blistering, as a remedy, is seldom employed, being at best a painful and debilitating procedure. It is capable of doing great good, however, in well-selected cases. For the management of the ordinary cantharidal blister, see BLISTERS. Revised by H. A. HARE.

Vespa'sian (full name *Titus Flavius Sabinus Vespasianus*): emperor; b. at Reate, Italy, Nov. 17, 9 A. D., of a family in ordinary circumstances; entered the army; held superior commands under Claudius in Germany and Britain; governed Africa as proconsul under Nero, and was sent by him in 66, at the head of a large army, to suppress the rebellion in Judæa. When, after the murder of Galba, the civil war broke out between Otho and Vitellius, Vespasian was proclaimed emperor (July 1, 69), by his own army, and shortly after was recognized by the whole eastern part of the empire. He left the final reduction of Judæa to his son Titus, and proceeded to Rome, where, after the murder of Vitellius, he was immediately recognized by the senate. A great change now took place in the government of the state. The new emperor was frugal and unostentatious in his personal habits, honest and open in his dealings with all persons. The character of the senate was restored and the worst elements in it expelled. A firm discipline was established in the army. In his external policy he was also successful. Jerusalem, and with it the whole of Judæa, were taken in 70; an insurrection in Gaul was speedily suppressed; new conquests were made in Britain and Germany. For the city of Rome he did much. He rebuilt the capitol, which had been burned by the adherents of Vitellius; he erected a temple of peace, began the Colosseum, and encouraged the restoration and rebuilding of those parts of the city which had remained in ruins since the great conflagration under Nero. D. at Reate, June 24, 79.
Revised by G. L. HENDRICKSON.

Vespers [from Late Lat. *ves'peræ*, vespers, liter., plur. of Lat. *ves'pera*, evening: Gr. ἑσπέρα]: in the Roman Breviary, the last but one of the canonical hours, the one preceding compline and following the nones. It is celebrated in public in the churches, often with brilliant music. The service occurs about the time of the lighting of the lamps, being theoretically proper to sunset, and varies with the day of the week.

Vespertilion'idæ [Mod. Lat., named from Lat. *vesperti'lio*, bat, so named from its flying in the evening, deriv. of *ves'per*, evening]: a family of bats devoid of a nose leaf and having the nostrils opening by simple crescentic or round apertures at the end of the muzzle. The ears are moderate or large, mostly free, sometimes united, and each provided with a well-developed tragus; the teeth are normally developed, the molars with W-shaped ridges, the canines moderate, the incisors of the upper jaw in two groups separated by a median hiatus, in the lower jaw present all round; the wings are large; the middle finger generally provided with two phalanges, and with the first phalanx extended, in repose, in a line with the metacarpal bone; the stomach is sacciform, and the two extremities approximated; the premaxillary bones are small, and separated by a wide median interspace. The family is cosmopolitan in its range, and embraces most of the species flourishing in the northern temperate countries. About twenty genera have been described, but almost, if not quite, the most comprehensive is *Vespertilio*. Most of the species found in the U. S. belong to *Vespertilio*, *Scotophilus*, *Nycticejus*, *Atalapha*, *Corynorhinus*, and *Antrozous*. Revised by F. A. Lucas.

Vespucci, ves-poot'chee, Amerigo (Latinized *Americus Vespucius*): navigator; b. in Florence, Italy, Mar. 9, 1451. He was educated by his uncle, a Dominican, was employed in the commercial house of the Medici at Florence, and about 1491 went to Cadiz, Spain, where he engaged in trade. Later he was connected with Juonato Berandi, a Florentine merchant, who had settled at Seville, and who fitted out the second expedition of Columbus in 1493, and in 1495 made a contract with the Spanish Government to prepare another fleet for western exploration; by his death the execution of this contract fell to Vespucci, and it is known that he was employed on it in 1496. Subsequently he was engaged in some or all of the voyages mentioned below; he was for several years in the employ of Portugal, and on Mar. 22, 1508, he was appointed chief pilot of Spain. As America was named in honor of Vespucci, and as he was supposed by many to have been the first discoverer of the continent, his voyages have been a subject of endless disputes; the question of their authenticity never has been settled satisfactorily. The only direct authorities for them are letters attributed to Vespucci himself, and probably never intended for publication. These letters were addressed to different persons, one series to a friend of Vespucci, Pietro Soderini, gonfaloniere of Florence. The originals are unknown, and even the language in which they were written is a matter of conjecture. Translations were published at different times and in different languages from 1504 to 1507; but these differ considerably from each other, and all are very obscure, especially in their descriptions of the first two voyages. In these letters Vespucci states that he made four voyages, two by order of the King of Spain, beginning May 10 (or 20), 1497, and May, 1499; and two for Portugal, beginning May, 1501, and May, 1503. In all he appears to have held a subordinate position, perhaps that of pilot or factor. The first expedition consisted of four ships, and Vespucci says they reached land "upon a coast which we thought to be that of a continent." This land is conjectured by some to have been the northern coast of South America, by others Central America and Mexico. In either case the date given—twenty-seven days from the Canaries—would make the landfall several weeks earlier than the discovery of the North American continent by Cabot, and fourteen months earlier than the discovery of South America by Columbus. But there are no contemporary notices of this expedition. Muñoz proved, or thought he proved, that Vespucci was in Spain from May, 1497, to Oct., 1498; and there are many other reasons for supposing that this voyage was never made, or has been ante-dated in the extant accounts. Humboldt supposed that it was the same as the so-called second voyage of 1499; but this is contradicted by Vespucci's repeated statements that there were four voyages. As for the second voyage, the description of it agrees fairly well with the exploration made by Pinzon about this time; but there is independent testimony that in 1499 Vespucci was with Ojeda on the coast of Venezuela. The third voyage, or the first for Portugal, agrees with what is known of the expedition sent from Lisbon in 1501 to follow up Cabral's discovery of Brazil. Vespucci says that after exploring the Brazilian coast the ships sailed S. to lat. 52°, and that he discovered land, which may have been South Georgia. The fourth voyage was, pretty clearly, that of Gonzalo Coelho, who went to Brazil in 1503. Vespucci states that he became separated with two ships, one of which was wrecked, and that the crew of this wrecked ship was left in a fort (near Cape Frio?). In one of his letters he mentions his intention to write "a little book" on the voyages; but if this was ever published it is now unknown. Latin translations of the letters were added as an appendix to the treatise *Cosmographiæ introductio*, published by Martin Waldseemüller ("Hylacomylus"), at St.-Dié, in 1507. In this work, now extremely rare, Waldseemüller says: "And the fourth part of the world having been discovered by Americus, it may be called Amerige; that is, the land of Americus, or America." This idea, originating in an obscure work, was generally adopted within a few years, the name being first applied to South America and subsequently extended to the whole continent. It should be noticed that Vespucci never claimed the honor of the discovery for himself, nor as a subordinate could he properly do so. It is known, also, that he was on friendly terms with Columbus. On the other hand, Vespucci's letters, obscure as they were, were the first published notices of a western continental region; he can not be accused of originating the name, which did not come into general use until after his death. Conservative critics are inclined to relieve him from any charge of deliberate falsification, and to attribute much of the confusion to careless translations and editing of the letters. Vespucci died in Seville, Spain, Feb. 22, 1512. See Humboldt, *Examen Critique*, vols. iv. and v.; Viscount of Santarem, *Recherches sur l'Améric Vespuce et ses Voyages* (1842; English translation 1850); Major, *Prince Henry the Navigator*, pp. 367–380 (1868); Varnhagen (Viscount of Porto Seguro), various opuscules on Vespucci; S. H. Gay, *Amerigo Vespucci* (in *Narrative and Critical History of America*, vol. ii.). Herbert H. Smith.

Vest, George Graham: U. S. Senator; b. at Frankfort, Ky., Dec. 6, 1830; graduated at Centre College, Kentucky, in 1848; studied law, and removed to Missouri to practice; was elected to the Missouri House of Representatives in 1860; favored secession, and was a member of the Confederate Senate. In 1879 he was elected as a Democrat to the U. S. Senate, where he has been prominent in many important debates. He was re-elected in 1885, in 1891, and 1897.

Vesta [= Lat.: Gr. Ἑστία, Vesta, liter., personification of ἑστία, hearth]: in Roman mythology, the goddess of the home or hearth, corresponding to the Greek Hestia. Very few and unimportant myths were formed on the idea of this deity, but the grave and sublime rites which her worship developed show that of the whole religious feeling which underlay the Roman mythology she formed the center. She was not represented by any statue or image in her temples, but a perpetual fire burned on her altars, and each Italian city or community had raised an altar to her. The Vesta of the Roman empire had her temple at Lavinium, on the Via Appia, 20 miles from Rome, and hither the consuls and other high officials of the republic went to offer up their sacrifice before entering on their duties. The Vesta of the city of Rome had her temple in the Forum, near that of the Penates, and here she was served by her own priestesses, the vestal virgins, and a festival, the *Vestalia*, was celebrated in her honor on June 9. The number of the vestal virgins was originally four, but afterward six. They were chosen by the pontifex maximus when between six and ten years old, and they served the goddess for thirty years, spending ten years in learning their duties, ten in the actual performance of them, and ten in teaching them to the novices. Their principal duty consisted simply in keeping alive the sacred fire on the altar of the goddess, but thereby the guardianship of the holiest which Roman life contained was intrusted to them; and although it has become impossible to us to discern clearly the whole bearing of this institution on the life of the community, numerous well-ascertained facts indicate the great importance ascribed to it. When a consul met one of the vestal virgins in the streets, he bowed with reverence, and the lictors lowered the fasces while she passed by. When a convict was seen by one of the virgins, he was immediately released if she demanded it. If the sacred fire went out from neglect, the priestess during whose watch it happened was stripped and scourged by the pontifex. If one of them committed adultery, she was buried alive and her seducer was flogged to death in the Forum. The temple of Vesta was purified on June 1, and the fire was renewed on Mar. 1. Revised by J. R. S. Sterrett.

Vestals, or **Vestal Virgins**: See Vesta.

Vestments, Ecclesiastical [*vestments* is from O. Fr. *vestement*, *vestiment* < Lat. *vestimen'tum*, clothing, deriv. of *vesti're*, clothe]: the dress appropriated to those who minister in the divine offices—viz., bishops, priests, deacons, sub-deacons, acolytes, servers, and choristers. The employment of vested choristers is a peculiarity of the English Church. In the papal chapels, and generally on the continent of Europe, men are employed as singers, and in some of the French churches, and in the Roman Catholic churches in the U. S., the singers are of both sexes, but they are not considered among the ministers of the altar. In English cathedrals, and in many parish churches, the singers, men and boys, are vested in cassock and surplice, and sit in a part of the church appropriated to their use, called the choir, between the presbytery, the place of the clergy, and the nave, the place of the people. The cassock (Fr. *soutane*) is a long coat reaching from the shoulders to the heels, with a low-standing collar, and fastened through its entire length by a row of small buttons. The English cassock, however, is more properly made double-breasted and secured with hooks and eyes. A band around the waist, tied at the left side, called the cincture, serves to keep it in its place. The surplice is a linen garment hanging loose about the person and having large sleeves. The Anglo-Saxon surplice is large and full; it reaches nearly to the feet, and when it is properly made, without any opening in front, falls into ample and graceful folds. These surplices are still in use in the English Church, at least by the clergy. Choristers' surplices are generally made shorter and less full, approaching more nearly the form called *cotta* on the Continent. The Roman cottas are usually very small, reaching but little below the waist, and are sometimes made entirely of lace. The rochet and the alb are modifications of the surplice. The former is a short and the latter a long surplice, with close sleeves. The rochet is commonly considered as the episcopal form of the surplice, but it is sometimes worn by acolytes. The alb is a eucharistic vestment. The surplice is worn by the clergy in the choir offices or daily services, and in the ministration of all rites and sacraments except the holy communion. On solemn occasions the principal minister wears also a cope and biretta. The cope is a cloak cut in such a way that when it is spread out the lower line forms half a circle, of which the front is the diameter. An opening, half an ellipse, is cut in the straight side for the head, and the garment is fastened in front by a large buckle called a morse. The cope is usually made of some valuable material, and is richly embroidered. One given by Queen Philippa (1328–69) to Durham Cathedral is kept there in excellent preservation. The biretta is a four-sided cap with a flat top, and ridges on it extending from the corners to the middle—four for doctors of divinity, and three for ordinary clergymen. A ridgeless biretta appears to have been formerly common in England, and is often seen in old sculpture and in paintings. A stole is also worn at baptisms, marriages, and similar functions, but not, according to the old English rule, at the daily service. In the churches of the Roman obedience the public recital of the daily offices has so long been obsolete that the tradition seems to have been lost. The old rule, however, is probably the same as the English. This stole is 2½ inches wide and about 2½ feet long. It is usually made of silk, and is frequently embroidered.

The eucharistic vestments are the amice, the alb, the girdle, the maniple, the eucharistic stole, and the chasuble. The amice is a square piece of linen, embroidered on one side, which the priest rests for a moment on his head, and then spreads over his shoulders. It is seen as an embroidered collar above the alb. The alb is a long garment with close sleeves, secured about the waist with a girdle. It is commonly made of linen, but occasionally of lace, and it may have embroideries on the sleeves and lower part, called apparels. The Greek alb (*chitonion*) is sometimes made of richer materials, and is colored. The girdle is also of linen, and is made of strands of twisted cord. In the East a broad band (Gr. *zone*) is sometimes worn instead. The maniple (*sudarium*; Gr. *epimanikia*) was originally of linen, but is now made of the same materials and in the same form as the stole. It is worn upon the left wrist. The eucharistic stole (Gr. *orarion*) is 3 yards long and nearly 3 inches wide, sometimes widened at the ends to make room for embroidered crosses. It is crossed over the breast and secured by the girdle. The chasuble (Lat. *casula*; Gr. *phelonion*; in old English, the vestment) is worn over all. It was originally, and is still sometimes in the Greek Church, cut in the form of a complete circle, in which form its ample folds are extremely graceful. It was at a later time made like an ellipse, or rather like the *vesica piscis*, which was a favorite shape in England. The modern Roman chasuble is very much cut away in front. In England, France, and Belgium a cross is commonly affixed to the back; in Italy and other Roman Catholic countries in the West, to the front of the chasuble. This is properly of the shape known as the Y-cross. The deacon (in England, the "gospeller") wears over his alb a dalmatic (Gr. *stoicharion*), and the sub-deacon (in England, the "epistoler") wears a tunicle, but no chasuble, which is reserved exclusively to the celebrant. The dalmatic is a coat partly open at the sides, with wide sleeves. The tunicle is a garment very similar to the last, but less highly ornamented. The deacon wears his stole over his left shoulder; the ends are brought together and fastened under his right arm. The sub-deacon wears no stole. In the Western Churches acolytes at a high mass (in England, solemn service) wear albs and amices. At a low mass (plain service), where there are neither ministers nor choir, but only a single priest with a server, the latter wears a cotta or rochet over his cassock, which last is usually crimson. In the Greek Church servers and low masses are unknown. The priest is always attended by a deacon vested in alb and dalmatic. When a bishop is the celebrant, he wears a dalmatic in addition to the priestly vestments, to signify, it is said, that all the offices of the ministry are united in his person. The Western bishops also wear, instead of the biretta, a mitre, either plain or decorated; the former is of white linen, the latter of gold and precious stones. The pall, pectoral cross, ring, gloves, sandals, and staff also appertain to the bishop.

In the churches now or formerly of the Roman obedience the color of the cassock is, for choristers, servers, or acolytes, crimson; for the principal acolyte, sometimes purple. Sub-deacons, deacons, and priests wear black, bishops purple, and cardinals crimson. The pope alone wears white. The surplice, cotta, rochet, alb, and amice are properly made of white linen, though in the West all except the last are sometimes made of lace. The maniple, stole, tunicle, dalmatic, and chasuble vary in their colors, following what is called the sequence of the seasons. The Roman sequence is now generally adopted in the West. This gives white for Christmas, Easter, and saints' days, purple for Advent and Lent, red for Pentecost and feasts of martyrs, black for Good Friday, and green for ordinary days. The color for *feriæ* or week-days usually follows that of the preceding Sunday. The English or Salisbury (Sarum) sequence differs from the Roman not only in the use of more colors—brown or gray being allowed instead of purple, blue instead of green, and yellow instead of white on the feasts of confessors—but also in the order in which the colors are used. According to this sequence, all Sundays at the festal seasons are white, and all other Sundays are red. White Sundays are followed by white feriæ, but at the seasons of Advent and Lent the feriæ are purple; at those of Epiphany, after the octave, and Trinity, they are blue or green. The old Sarum tradition, however, has been lost, and it has probably been only partially recovered. The Eastern calendars do not appear to recognize any uniform sequence of colors.

This account includes all the vestments which are received by Catholic tradition, both in the Eastern and Western Churches. There are, however, local variations, and there are other vestments which have been worn only at particular times and places. The Western mitre is unknown in the East, except among the Armenians; the Oriental bishops wear a peculiar cap. The Patriarch of Alexandria wears a cap resembling a crown, which he never removes during the whole liturgy. The Eastern bishops wear attached to the stole a square ornament called the *epigonation*. This was originally merely a handkerchief, but it is now made of some stiff material like brocade, and richly decorated. The stole itself is joined together for nearly its entire length, and an opening is left at the top through which the head is put. Two maniples are worn instead of one. The Greek priest's cap is not square, but round. There are also local peculiarities in the West. The rochet and chimere worn by the English bishops are a modification of the daily dress, or perhaps the parliamentary robes, of their predecessors. The simple linen sleeves of the rochet have been superseded by lawn, and the chimere of scarlet silk by one of black satin or velvet. A black gown was formerly worn by some English preachers. The rival derivations of it from the gown worn by Calvin at Geneva or from the dresses of the mediæval monks may be dismissed as witty inventions. It is probably merely the academic gown which English clergymen

were formerly accustomed to wear when they went about their parishes. The square cap and the hood, much worn by the English clergy, are academic vestments. Hoods also form parts of several monastic dresses, which, however, are for the most part modifications of the cassock. The amyss (which is not to be confounded with the amice) was at one time a favorite choir-vestment in northern countries. It was in form not unlike a small chasuble, and was usually made of gray fur. It was only worn at the daily service.

Of the origin of the vestments little is certainly known. The linen ones have probably been inherited by Christians from the Hebrew Church. The others Dr. Rock believes to have been adopted from garments worn in daily life, retained by the Church after others had laid them aside, adorned and beautified and consecrated to sacred uses. Mr. Marriott states more specifically that they were dresses worn by persons of condition on state occasions, which were gradually adopted by the Church. This view is strengthened by the fact, alluded to by Mr. Planché, in his *Cyclopædia of Costume*, that emperors and kings were long allowed to wear the chasuble, and afterward the dalmatic and tunicle, at their coronations and when assisting at high mass. According to the view of Mr. Marriott, most of the vestments were introduced into the Church in the interval between the ninth and the twelfth centuries. Others, he thinks, can be traced back to the fourth, and some to the first century. He is also of the opinion that the color of all ecclesiastical vestments was originally white. As Mr. Marriott has made a careful study of the subject, the present writer thinks it fair to state his views, without, however, in all respects adopting them. The chief value of his work lies in the illustrations and in the elaborate quotations from ancient authors. The literature of the subject is extensive. Marriott's *Vestiarium Christianum*, Rock's *Hierurgia*, Neale's *Holy Eastern Church*, and Blunt's *Annotated Book of Common Prayer* are perhaps the best modern authorities. They contain full references to the older writers. To sum up the whole matter, it is only necessary to add that the same vestments have been in use from time immemorial in both the Eastern and Western Churches, and that, though they may have been, and doubtless were, introduced gradually in the way already mentioned, they varied from each other only in matters of detail or in bearing different names in different times and places. The idea of a dress peculiar to the ministers of religion at their ministrations is older than Christianity itself, and is recognized not only by Roman Catholics, but by several denominations of Protestants.

The vestments of the altar include a cere-cloth of waxed linen, which is spread over the stone slab (*mensa*), fitting it closely to protect it from the damp. Over this is placed the superfrontal, hanging down about 10 inches in front. Before the altar hangs the frontal, reaching nearly to the ground, and embroidered with two broad stripes called orphreys. Both superfrontal and frontal may have a rich fringe, and both are usually of the color of the season. The former, however, may with propriety be always red. Over all are placed three linen cloths. Two of these are of the exact size of the mensa, but the third is much longer, and hangs nearly to the ground at both ends. It is embroidered in a particular manner, and is usually adorned at the edges with lace. When the altar is not in use, a green covering of silk or baize or some similar material is laid upon it.

BEVERLEY R. BETTS.

Ves'tris: a famous family of dancers, originating in Florence, Italy, but settled in Paris. The two most celebrated members of the family were—(1) GAETANO APOLLINO BALDASSARE VESTRIS (b. Apr. 18, 1729, d. Sept. 27, 1808), ballet-master and first dancer at the opera in Paris from 1749 to 1781; and (2) MARIE AUGUSTE VESTRIS-ALLARD, or VESTRIS II. (b. Mar. 27, 1760, d. Dec. 6, 1842), a natural son of Gaetano by the celebrated Madame Allard (first dancer at the opera from 1780 to 1816), and professor at the Conservatory till 1828. The ballet compositions of the Vestris family were insignificant, but their style of ballet-dancing became predominant on all stages of Europe, and reigned for more than a century, largely influencing also the social dances of the higher classes.

Vesunna: See PERIGUEUX.

Vesu'vian, or **Id'ocrase** [*vesuvian* is deriv. of *Vesuvius*; *idocrase* from Gr. εἶδος, form + κρᾶσις, mixture, deriv. of κεραννύναι, mix]: a hard calcium aluminium silicate, with iron and manganese, sometimes used as a gem, but not much esteemed. It is of various colors.

Vesu'vius: a volcano standing on the southwestern shore of Italy overlooking the Bay of Naples. In the midst of a densely populated district, and in full view from routes of commerce on the Mediterranean, it has been more fully studied and its history is better known than that of any other volcano. There are two mountain-masses. That which is at present the higher is conical in form, with a crater at the top, and has an altitude above the sea of about 4,000 feet, the height varying with the progress of eruption. The other mass is a crescent-shaped ridge partly surrounding the cone, and has an extreme altitude of 3,730 feet. It is called Monte Somma, and it is part of the rim of an ancient crater about 3 miles in diameter.

During the period of early Roman history Vesuvius is not mentioned as a volcano, and its fires had been dormant for so many centuries that its volcanic character was not generally understood, although suspected by a few scientific travelers. On its outer slopes were vineyards and gardens, and the interior of its crater was a plain several miles in width, partly covered by wild vines. It is related that Spartacus and his followers took refuge in this crater, where they were besieged by a Roman army. In the year 63 and afterward there were earthquakes in the vicinity, and in 79 an explosion, followed by expulsive eruption, covered the surrounding country with volcanic ashes and volcanic mud. The cities of Herculaneum and Pompeii were destroyed and so deeply buried that even their sites were unknown for several centuries. There ensued a period of quiet, followed by an explosion in the year 203, and other explosions or violent eruptions are historically recorded in the years 472, 512, 685, 993, 1036, 1138, 1306, 1500, and 1631. There were probably other eruptions during this time of which no record has been discovered, but it is nevertheless true that there were a number of periods a century or more in length during which the volcano was not active. From the year 1666 to the present time the activity has been nearly continuous, the longest intervals of rest covering not more than four or five years. The activity of the last 1,800 years has been confined to the conical mountain, which bears specifically the name Vesuvius, and the mountain has been built up during that period by ejections of ashes and lava. Its summit has been repeatedly blown off by great explosions, after which new cones have been built within the crater. Monte Somma is part of the rim of the crater existing before the catastrophe of 79, and has had no share in the later activity. The fullest account of the mountain in the English language is contained in Lobley's *Mount Vesuvius* (London, 1889).

G. K. GILBERT.

Vesz'prim (Germ. *Weissbrunn*): capital of the county of Veszprim, Hungary; on the Stuhlweissenburg-Kisczell Railway, about 65 miles S. W. of Budapest (see map of Austria-Hungary, ref. 6–G). The town is the seat of a Roman Catholic bishopric (founded about 1000 A. D.), and has a magnificent cathedral and other memorable buildings, a theological seminary, a gymnasium, many churches, and monasteries. The ancient town, known to the Romans by the name of Cimbria, became Hungarian in 1683 after the defeat of the Turks before Vienna. Pop. (1886) 14,800, mostly agriculturists and agricultural traders.

H. S.

Vetan'curt, or **Vetancour**, AGUSTIN, de: missionary and author; b. at Mexico city in 1620. He joined the Franciscan order at Puebla, became a noted linguist and teacher, and was a member of the provincial chapter and commissary-general of the Indies. His most important work is the *Teatro Mexicano* (4 parts, 2 vols., Mexico, 1697–98; reprint, 1870–71), a collection of treatises on Mexican geography and history and on the history of his order. Some of it is compiled from Torquemada, but there is much valuable original matter. Other works are *Arte de Lengua Mexicana* (1673), various biographies, theological essays, etc. D. in Mexico, 1700.

HERBERT H. SMITH.

Vetch, **Fitch**, or **Tare** [*fitch* is M. Eng. *ficche*, *feche*, for *veche*, from O. Fr. *veche*, *vesce* > Fr. *vesce* < Lat. *vi'cia*; *tare*, cf. M. Eng. *tare-fitch*, wild vetch]: any one of several leguminous climbing herbs of the genus *Vicia*. North America and Europe have each several species, some common to both continents. One of the most important is *Vicia sativa*, extensively cultivated in Europe as a forage-plant, and also occasionally grown in the U. S. The bitter vetches (*Orobus tuberosus*, etc.) are also leguminous forage-plants of Europe. The tubers of some sorts are used as food. Other so-called vetches are the genus *Lathyrus*, often called vetchlings.

Revised by L. H. BAILEY.

Vetch, James, F. R. S.: engineer; b. at Haddington, Scotland, May 13, 1789; educated in the Royal Military Academy at Woolwich; was engaged upon trigonometrical surveys 1806–24; was manager of silver mines in Mexico 1824–35; constructed in Mexico many roads and other public works; became consulting engineer to the admiralty, conservator of harbors, metropolitan commissioner of sewers, and royal commissioner of harbors of refuge. He was the author of *An Inquiry into the Means of Establishing a Ship-navigation between the Mediterranean and the Red Sea* (1843). D. Dec. 7, 1869.

Veterinary Medicine [*veterinary* is from Lat. *veterinarius*, a physician for animals, deriv. of *veteri'nus*, for carrying or drawing burdens (used with *bestia*, *pecus*), *veteri'næ*, beasts of burden or draught, probably deriv. of *vetus*, old, i. e. suited only for carrying burdens]: medicine as applied to animals. The term *veterinarius* was at first applied to all who had to do with animals, but was later applied only to those who treated their diseases and conducted the *veterinaria*, or places in which diseased and injured animals were cared for.

Early History of the Science.—The beginning of veterinary medicine may be traced to the earliest time of which we have a record. The chief wealth of the ancient nomadic tribes was in the possession of their flocks and herds, and when these were diseased or wounded, efforts were made for their restoration. Some of the oldest carvings of Egypt and India depict men in the act of administering medicine to cattle, dogs, and fowls. At first, all medicine, including the treatment of human beings and animals, was in the hands of one class; but with increased knowledge and experience the most famous physicians confined themselves to the treatment of people, and the diseases of animals were relegated to those less competent. On account of religious prejudices the human body was not dissected by the ancients; hence, for many centuries, all accurate anatomical knowledge was based on the dissection of animals, and this branch of veterinary science was developed very early.

In India, great attention was devoted to the diseases of animals as early as 1000 B. C., and many veterinary hospitals were established, of which the most famous was that of Surate. The Medes and Persians were much interested in animals, and it is known that there was a class of men in the oldest times who devoted themselves to curing their diseases. The Jews for a period of several centuries from the time of Abraham lived a nomadic life and were chiefly herdsmen and shepherds. The laws of Moses show that these people possessed some knowledge of the diseases of animals, and realized the importance of subjecting all food flesh to a most careful examination.

Veterinary medicine received many additions and much advancement from the Greeks, and the most authentic records of early veterinary progress are from this source. Vergil relates that Melampus, a Greek shepherd who was widely known for his great success in curing the diseases of animals, was called by King Proteus to treat his insane daughter. Having observed that hellebore was of value in similar conditions in sheep, Melampus administered it to the girl and effected a cure.

Chiron, who lived between 1400 and 1300 B. C. and was renowned as the teacher of Æsculapius, was both a physician and a veterinarian; he was called the Centaur, because he devoted so much attention to animals. One of his books on horses and their treatment in disease was, according to Kircher, translated into Arabic. Chiron is credited with having domesticated the horse and trained him to useful work.

For several centuries medical thought in Greece was governed by the Æsclepiadæ, but there is nothing to indicate that they applied their skill to animals, although it is probable that there were veterinarians then, for, according to G. Teugler, the medals of that time that bear a figure of a horse, the fore part of which is human and holds a staff about which a snake is coiled, are the insignia of veterinary medicine.

Hippocrates, the father of medicine, born in 460 B. C., was the first to break away from the superstitions and mysticisms of the disciples of Æsculapius and to place medicine upon a new footing, the basis of which was experience. Of the numerous books that have been ascribed to Hippocrates many are spurious, and among these is the work on equine pathology (*hippiatrica*). Since Hippocrates was unable, on account of his religious belief, to dissect human cadavers he derived his knowledge of anatomy from the dissection of animals, and thus incidentally learned much comparative pathology. Among the diseases he studied and described are hydatid cysts in the lungs, dislocations of the joints of oxen, ascites of the ox and dog, epilepsy of goats and sheep, and fever of all of the domesticated animals.

One of Hippocrates's contemporaries was Xenophon, who was famous both as a general and as a horseman. Xenophon was a breeder of horses, and wrote a large work on the art of horsemanship, a part of which is devoted to the diseases and injuries most commonly met with. The descriptions of the exterior of the horse and the advice as to veterinary hygiene are most excellent, and can be observed with profit at the present time. Of the diseases of horses, a few are described in a very clear way, and the treatment advocated consists chiefly in the application of hygienic measures.

Aristotle, born 384 B. C., was not only the father of zoölogy and comparative anatomy, but was also a productive worker in the field of veterinary science. He described a number of diseases of the pig, dog, ox, ass, and horse. He said that the principal diseases of the horse were asthma, colic, tetanus, and founder; of the ass, glanders; and of the ox, pneumonia and foot and mouth disease. He knew that mules were sterile and described several operations on animals.

The Romans devoted considerable attention to veterinary medicine, a fact which is explained by the great love of the people for agriculture, cattle-breeding, and war. It is evident, also, that the old Romans appreciated the financial value of having their valuable animals well treated, and every large estate had buildings for the accommodation of sick animals and slaves, and the diseases of both of these classes of creatures were treated of in the works on agriculture. Cato the elder described some of the diseases of the domesticated animals in *De re rustica*; but his work is valueless, since he was a very poor observer of symptoms and was guided by the prevalent Roman superstitions; for example, for all diseases of cattle his advice was to order the administration of a raw egg by a servant who must be fasting at the time.

Columella, who wrote about the middle of the first century, was one of the most learned and practical agricultural and veterinary authors of ancient times. Of his thirteen books on agriculture and allied subjects, the sixth and seventh are devoted to veterinary subjects. The principles of hygiene are dwelt upon at great length, and especial attention is called to the need of proper buildings, good air and food, and care of the skin. The fact that some diseases of animals are contagious is recognized, and directions are given to separate diseased from healthy cattle. In describing symptoms he was especially clear, and his treatments were rational and free from the superstitions then so prevalent. In this last respect he was more advanced than the physicians of his time, for they still clung to charms and incantations as an important part of their therapeutics. The work of Columella elevated veterinary medicine by a longer step than that of any other Roman author.

Absyrtus, who lived some 250 years later, was the greatest veterinarian of his time. He was attached to the army of the Emperor Constantine, and his writings are in the form of letters to veterinarians. Absyrtus was more free from superstition than the contemporary physicians and more than their equal as a scientist. He was a veterinarian solely, and the first, of whom we have an authentic record, who devoted himself exclusively to this work. His predecessors had combined agriculture, natural history, breeding, etc., with veterinary medicine. The letters of Absyrtus are very numerous and cover a great variety of diseases. They show him to have been a popular teacher and a man of great experience. His greatest service to his profession was that he separated it from the medicine of physicians, which was then sinking into the depression of the Middle Ages.

Other veterinarians of this time whose writings still exist were Hierocles, Theomnestus, and Vegetius. The last was the most prolific author, and left the most extensive and comprehensive work of the ancients.

In the Middle Ages.—During this period veterinary medicine made but little progress in respect to scientific growth, but the standing and social position of the veterinarian advanced materially. Every nobleman or wealthy person maintained a large estate, among the chief features of which was a stud and collection of a large variety of animals. Everything that pertained to the animals of sport—

the horse, dog, and falcon—received the greatest consideration, and it thus happened that the masters of the horse, who were the veterinarians of the period, belonged to one of the most honored callings.

The Emperor Constantine Porphyrogenitus (911–959) ordered the compilation of a large work on the diseases of animals, and in this we find that ancient sources are used almost exclusively. This work, known as the *Hippiatrica*, was translated into French, Spanish, German, and later into Italian. It was the standard veterinary work for several hundred years.

During the scholastic epoch that followed the founding of the University of Bologna, a number of famous scholars studied veterinary science and produced veterinary works. Of these, Albertus Magnus (1193–1280), Bishop of Regensburg, was one of the best known. Jordanus Rufus, the master of the horse of Frederick II., wrote a book entitled *De Medicina Equorum*, which appeared about 1250. Rufus was skilled in surgery and in horseshoeing, and his book contains much that was original and valuable. Theodore (1205–98), Bishop of Cervia, was also a writer on veterinary medicine.

Veterinary medicine first received legal recognition as a profession in Spain in the fourteenth century. It was then classed with medicine and pharmacy, and those who wished to engage in the practice of veterinary medicine were obliged to undergo an examination before a government board, and unless properly qualified the right to practice was denied. This custom was continued until 1835, when this function was transferred to the veterinary schools.

In Modern Times.—The first important advance in veterinary science in modern times may be traced to the production of a work by Carlo Ruini in 1590 on the anatomy and diseases of the horse. This work was most excellent, and marks an epoch in the history of veterinary medicine. It is illustrated with wonderfully good plates, showing all of the muscles of the horse, and the descriptions are remarkable for their accuracy. From the publication of this work until the founding of the first veterinary school in 1762 but little that was original was produced. Most of the writings of this period were plagiarisms from the ancients or from Ruini. A number of short books or monographs which were of some value had, however, been published, and these, with the accumulated traditional experience of the centuries, constituted the growth of the period preceding the establishment of the first veterinary school.

The annual plagues were at this time (the eighteenth century) very prevalent in Europe, and had occasioned enormous losses. Rinderpest, lung plague, anthrax, sheep-pox, foot and mouth disease, glanders, and numerous other affections had extended into nearly every agricultural district, and the stock-raisers found their occupation threatened and in many cases ruined. The armies, also, were in great need of competent men to direct the care of the horses and to treat those that were diseased. Hence the time was ripe for the founding of an institution where systematic instruction in veterinary medicine could be given.

Veterinary Schools.—Claude Bourgelat (1713–79) was originally a lawyer, but, becoming dissatisfied with his profession, he entered a cavalry regiment as an officer and afterward became director of a riding-academy in Lyons. His passion for anatomy and pathology was cultivated by a study of the old books on hippiatry, and by the famous surgeon Pontean. He published books in 1747 and in 1753 which showed him to be a great reformer in veterinary medicine. In 1762 the French Government decided to open a veterinary school in Lyons, and Bourgelat was selected to conduct it. The fame of this school and its director were so great that students came from all over Europe, and the first year there attended it Danes, Swedes, Prussians, Austrians, and Swiss. Many of these were sent by their respective governments, and afterward entered government service. Indeed, it was the custom for a great many years for all veterinary teachers to make a pilgrimage to Lyons or to Alfort and to study veterinary medicine at the fountain-head. In this way French views and French methods have become intimately incorporated with almost every veterinary school in existence. The success of this venture was so great that the king, Louis XV., ordered the establishment of another school in the north of France, and for this object the Castle of Alfort was bought and converted into a veterinary school. Bourgelat was transferred to Alfort and the Lyons school was placed in other hands.

The example of France was quickly followed by other countries, and before the close of the eighteenth century nearly every European country had established a veterinary school. The system of instruction has been changed from time to time, and the course of study has been lengthened, from one year to three and a half in Germany, to four years in France and England, and to five years in Russia.

One of the best of the existing schools is that of Berlin. The Imperial Veterinary High School of Berlin was established in 1790 by men who had studied at Alfort. At present it has ten professors, eighteen demonstrators, and about 400 students. The school is situated in a park of about 5 acres near the heart of the city. It is equipped with four commodious buildings besides two large hospitals, one for dogs, which can accommodate about fifty patients, and one for horses, with about eighty stalls. The students are divided into two classes, civil and military; the former are subject to no special restrictions, while the latter, who are educated at the expense of the Government for service in the army, are quartered together in a large dormitory and are subject to military discipline. The instruction is very thorough in all of its departments, and comprises, in addition to the branches usually taught in medical schools, such subjects as horseshoeing, meat inspection, zoötechnics, etc., and every step is illustrated in a practical way. The large clinics are used freely in giving practical instruction. This plan, more or less modified by local conditions, is followed in a general way by all European veterinary schools.

The first veterinary school in the U. S. was established in Boston in 1835, but its career was not prosperous and it soon passed out of existence. Since 1857 eighteen veterinary schools have been established in the U. S. and three in Canada. Some few of these are unfortunately operated on a purely commercial basis, they require no entrance examination, and attendance upon instruction for but a few months; while others require a strict entrance examination and a thorough course of three years. Four of the large universities have departments of veterinary medicine, i. e. Magill University, Harvard University, the University of Pennsylvania, and Cornell University. In each of these the course of study covers three years.

Veterinary medicine as a real science dates only from the establishment of the schools. Since this time (1762), if the work of Carlo Ruini and Bourgelat be excepted, all of the permanently valuable advances have been made. The literature that has sprung up during this period is quite voluminous and comprises special works on every branch of veterinary science. Most of these have been written in Germany and France and by professors in the veterinary schools. This is no doubt due to the fact that in these countries the schools are more generously supported by the Government than is the case in Great Britain and America, and the facilities and conditions for original work are therefore better. The first veterinary books of the new era were founded upon the old empiricism and the works of physicians. They had many deficiencies and errors, and it was not until the mistaken parallels from human medicine and surgery had been eradicted that veterinary literature was erected upon an independent basis.

It is natural that comparative pathology and bacteriology should have received much attention from veterinarians, and it results that many of the best-known investigators in these subjects belong to the veterinary profession. Among them are Chauveau, Nocard, Ercolani, Perroncito, Schuetz, Rabbe, Johne, Kitt, McFadyean, Salmon, and Law.

Results.—One of the chief results of the growth of veterinary science has been the progressive decline of animal plagues. From a distribution so great that almost every part of every civilized country suffered and from losses that amounted to millions of dollars each year, these diseases have been so restricted and, in some cases, exterminated, that present losses from diseases then prevalent bear but a small ratio to those then incurred. Rinderpest is stamped out everywhere but on the steppes of Russia, lung plague has been exterminated in the U. S., and in Europe it is a rare disease, foot and mouth disease has been greatly restricted, glanders is all but extinct in the U. S., and the districts formerly infested with anthrax are much restricted. But the veterinarian has not yet fulfilled his function, for many new problems have arisen during the past few years, some of which are already partly settled, but others are still awaiting a solution. These are in reference to such diseases as Texas fever, hog cholera, swine plague, tuberculosis of cattle, actinomycosis, etc., diseases that are comparatively new or which have become prominent recently.

All of the European countries have regularly appointed district veterinarians whose duty it is to stamp out contagious diseases, to look after the general hygienic conditions of the live stock, to supervise the markets and fairs, and see that no animals suffering from contagious diseases are offered for sale, and to make a periodical report upon the health of the district. It is through the efforts of these officers that such great success has been achieved in combating contagious diseases.

All countries have veterinarians attached to the armies to look after the health of the horses. In Great Britain the army veterinarians rank as officers; the chief of the veterinary service of each regiment has the rank of captain, and the head of the veterinary department of the army ranks as colonel. In Russia the chief of the army veterinary department has the rank of general. In the U. S. army the veterinary department is not thoroughly organized, and a civilian veterinarian is employed by each cavalry regiment.

In the U. S. measures directed against the diseases of animals are originated and carried out by the bureau of animal industry of the Department of Agriculture. Nearly every State has an official State veterinarian who is appointed by the Governor, and who maintains a general oversight over the health of the domesticated animals and enforces State measures for the eradiction or restriction of disease. Several States, as Maryland, Ohio, Pennsylvania, and New York, have enacted laws requiring all prospective practitioners of veterinary medicine to be examined by a State board of veterinary examiners. Every large city employs one or more official veterinarians, and the U. S. Government employs many for the inspection of meat that is exported to foreign countries. There are many local veterinary societies in various parts of the country, and the U. S. Veterinary Medical Association, which has members in all parts of North America, is a flourishing and influential organization.

The principal works on the history of veterinary medicine are J. M. Kreutzer's *Grundriss der gesammten Veterinärmedicin* (Munich, 1853); Tisseraut, *Histoire abrégée de la médecine vétérinaire* (Paris, 1855); Eichbaum, *Grundriss der Geschichte der Thierheilkunde* (Berlin, 1885); Baranski, *Geschichte der Thierseuchen und Thiermedicin im Alterthum* (Vienna, 1886); Postolka, *Geschichte der Thierheilkunde* (Vienna, 1887). LEONARD PEARSON.

Vétillart, vā'tēē'laar', MARIE MICHEL HENRI: civil engineer; b. in Le Mans, France, Sept. 5, 1848; educated at the École Polytechnique and École de Ponts et Chaussées, Paris, leaving the latter in 1874 at the head of his class; resident engineer of the port and canals of Calais 1875–86; engineer-in-chief of the ports of Boulogne and Calais 1886–92; French delegate to the International Maritime Congress of Washington 1889; engineer-in-chief of Havre and the other ports of the lower Seine since 1892. His principal constructed works are the new port of Calais, the widening and deepening of the canal of Calais, and the completion of the Boulogne breakwater. His published works are *Fonçage des pieux par injection d'eau* (1877); *Le port de Calais* (1889); *Fondations en terrains de sable des quais et écluses du port de Calais* (1889); *Les dragages* (at the Congress of Manchester, 1891); *La navigation aux États-Unis* (1892); *Notice sur le port du Havre* (Congress of London, 1883). His most remarkable work was the sinking the foundations of large piers and lock walls by means of the water-jet, which had previously been applied only to the sinking of piles. W. R. HUTTON.

Veto [from Lat. *ve'to*, I forbid]: the constitutional power of an officer or assembly to deny validity to a legislative or administrative act, or to prevent its execution. The magistrates of the Roman republic, and particularly the tribunes, possessed this power, although its limits and the mode of its exercise were quite different from those sanctioned by modern public law.

Under the British Constitution the crown has an absolute veto on the acts of Parliament and on those of colonial legislatures. The latest exercise of this right to deny validity to an act of Parliament occurred in 1707, and this royal prerogative is deemed practically obsolete. Over colonial legislation the veto is exercised in one of two ways—by the governor, who represents the crown, or by the crown in council.

The president of France does not possess either an absolute or a qualified veto upon the legislature. He is empowered, however, to demand a reconsideration of any measure by the legislative chambers; but if it is duly passed again, he is bound to promulgate it as a valid law. While he is denied a veto over the acts of the national legislature, he has authority to use it upon various resolutions passed by the general councils of departments.

By the imperial constitution of Germany no right of veto upon legislation is given to the emperor directly. There is provision, however, for an absolute veto by him, as King of Prussia through his representatives in the Federal Council, upon measures relating to the military and naval system and to the imperial taxes.

In the U. S. a qualified veto is given to the President by the Federal Constitution, and quite generally by State constitutions to the Governor, as well as to the mayors of cities by statute. The Federal Constitution (Art. I., § 7) requires every bill passed by Congress, and every order, resolution, or vote to which the concurrence of both houses is necessary, except on a question of adjournment, to be presented to the President, who is authorized to return it with his objections to the house in which it originated. When so returned it must be reconsidered and passed by a two-thirds vote of each house in order to become a law. The framers of the Constitution appear to have conferred this power upon the President for the supreme purpose of enabling the executive department to protect itself against encroachments by the Legislature; but they intended also that it should be used to prevent the enactment of improper laws. (*The Federalist*, No. 73.) Its frequent employment by a President has aroused criticism at times, and called out strenuous arguments for the limitation of its exercise. (See *Webster's Works*, vol. i., p. 267; 17 *Congressional Record*, p. 8435, *et seq.*) It seems to be conceded generally, however, that the President, in vetoing a bill which has been presented to him, is acting in a legislative capacity. Any considerations, therefore, which ought to influence him, if he were a Senator or a Representative, may properly control his exercise of the veto. He is at liberty even to return a bill which he believes to be unconstitutional, although the question of constitutionality may have been decided by the Supreme Court of the U. S. in opposition to his view. See Cooley, *Principles of Constitutional Law* (Boston, 1880); Anson, *Law and Custom of the Constitution* (part i., Oxford, 1886); Dicey, *The Laws of the Constitution* (London, 1885); Burgess, *Political Science and Constitutional Law* (Boston, 1890); Goodnow, *Comparative Administrative Law* (New York, 1893). FRANCIS M. BURDICK.

Vettori: See VICTORIUS, PETRUS.

Veuillot, vö'yō', LOUIS: author; b. at Boynes, Loiret, France, Oct. 11, 1813, in humble circumstances; grew up in Berey, a Parisian suburb; obtained in 1832, through a public labor bureau, employment on one of the ministerial provincial papers; gained notoriety by his polemical aptitude and his readiness to fight duels; was advanced by the Government from one paper to another, from one position to another, and became in 1843 editor of *L'Univers Religieux*. During a visit to Rome in 1838 he was so impressed by the religious ceremonies of Holy Week that he turned to serious things, and began to write religious romances—*Pierre Saintine* (1840), *L'Honnête Femme* (1844), etc.—and books of education—*Les Pélerinages de Suisse* (1838), etc. His polemical talent, however, suffered nothing from his conversion, and many of his articles, collected in several volumes under the title *Mélanges religieux, historiques et littéraires*, and of his books, *Les Libres penseurs* (1848), *L'Esclave Vindex* (1849), *Le Parfum de Rome* (1861), *Les Odeurs de Paris* (1866), etc., in which he championed the ideas of the Ultramontanes, and advocated a social order based on the monk and the soldier as its main supports, are conspicuous by their acridity. D. in Paris, Apr. 7, 1883. (See Jules Lemaître, in the *Revue Bleue*, Jan., 1894.)—His brother, LOUIS EUGÈNE VEUILLOT, b. at Boynes, Oct. 7, 1818, was his collaborator in the *Univers*, and published *Histoire des Guerres de la Vendée et de la Bretagne* (1847) and other works. Revised by A. G. CANFIELD.

Vevay, or **Vevey**, ve'vā': town; canton of Vaud, Switzerland; on the north shore of the Lake of Geneva, at the mouth of the Veveyse (see map of Switzerland, ref. 6–C). It has manufactures of watches, jewelry, leather, and woolens, and a trade in wine. It is a favorite residence for foreigners, is a health resort, and has many schools. Pop. (1900) 32,982. Revised by M. W. HARRINGTON.

Vevay: city; capital of Switzerland co., Ind.; on the Ohio river; about midway between Cincinnati and Louisville (for location, see map of Indiana, ref. 9–G). It was

settled by Swiss colonists in 1805, laid out in 1813, and given a city charter in 1877. It has 7 churches, several graded schools, water-works, electric-light plant, a national bank with capital of $50,000, and a semi-weekly and 3 weekly newspapers. Large quantities of fruit, tobacco, hay, wheat, and Indian corn are shipped here, and there are saw, planing, and flour mills, tobacco warehouses, furniture-factory, and brick-works. Pop. (1880) 1,884; (1890) 1,663; (1900) 1,588. EDITOR OF "TWICE-A-WEEK."

Veytia, vī-tee'ăă, MARIANO: historian; b. at Puebla, Mexico, in 1718. He studied law at Mexico, and by special license was admitted to the bar at the early age of nineteen. Subsequently he traveled for several years in Europe, and at Madrid became intimate with the celebrated Boturini. Mainly through his influence Veytia devoted the remainder of his life to the study of Mexican Indian history, in which he is said to have been greatly aided by the manuscripts collected by Boturini and left in Mexico. His principal work (interrupted by his death) is the *Historia antigua de México*. The completed portion, first published in 1836, covers the period from the Nahuatl invasion of Mexico to the middle of the fifteenth century, and treats principally of Texcucan history. D. in Puebla in 1779. HERBERT H. SMITH.

Vezin, HERMANN: actor; b. in Philadelphia, Pa., Mar. 29, 1829; son of a merchant; graduated at the University of Pennsylvania 1847; went to England to study for the stage, and after filling an engagement at York appeared at the Princess's theater, London, 1852; with the exception of a year (1857–58) in the U. S., has remained in Great Britain, playing chiefly in London. In 1863 he married Mrs. Charles Young, the actress. Among the parts played by him are Hamlet, Macbeth, Othello, Shylock, Marc Antony, Dan'l Druce in Gilbert's drama of that name, De Taldé in *The Danicheffs*, and Dr. Primrose in Wills's drama of *Olivia*.

Viaduct [Lat. *via*, way, road + *duc'tus*, a leading, deriv. of *du'cere*, lead]: a structure by which a road is carried over a valley, the word being usually restricted to the case of a deep valley where the piers are a more prominent feature than the bridge proper. In such cases the bridge spans are short in order that they may be erected without other false works than the piers themselves afford. On account of the height of the piers they were formerly built of timber, but iron or steel is now employed. Until the construction of the Pecos river viaduct in 1892, the Kinzua viaduct on the New York, Lake Erie and Western Railway, in the northern part of Pennsylvania, built in 1882, was the highest in the U. S. The roadway is 302 feet above the water of the creek, while the tallest pier is 297 feet high, and the total length is 2,052 feet, divided into 21 spans. The Kentucky river bridge on the Cincinnati Southern Railway is 275 feet high, and has only three spans, although the total length is 1,238 feet; it was erected without false works in 1875. The Pecos river viaduct on the Southern Pacific Railway, completed in 1892, is 2,180 feet long, and has 48 spans; the roadway is 328 feet above the surface of the stream, 26 feet higher than the Kinzua viaduct; most of the spans are plate girders, but the channel span is a cantilever structure 185 feet in length. Other large iron viaducts are those at Malleco, in Chili, 1,140 feet long and 250 feet high; at Loa, in Bolivia, 800 feet long and 336 feet high; and at Garabit, in France, 1,852 feet long and 406 feet high. The last has an arch for its principal span. (See BRIDGES.) At Souleuvre, in France, is a stone viaduct 1,200 feet long and 247 feet high.
MANSFIELD MERRIMAN.

Viardot, vēē'ăăr'dō', LOUIS: journalist and art critic; b. at Dijon, France, July 31, 1800; studied law in Paris; engaged in journalism; was manager of the grand opera from 1838 to 1841; founded in 1841 the *Revue Indépendante* in connection with George Sand and Pierre Leroux; visited most of the European capitals in company with his wife, the celebrated singer, Michelle Pauline Garcia. (See VIARDOT-GARCIA, MICHELLE PAULINE.) Besides numerous translations from the Spanish and Russian, he published *Études sur l'Histoire des Institutions et de la Littérature en Espagne* (1835); *Histoire des Arabes et des Maures d'Espagne* (2 vols., 1851); *Les Merveilles de la Peinture* (1868, *seq.*), of which a part, *Wonders of Italian Art*, was translated into English in 1870. D. in Paris, May 5, 1883.
Revised by A. G. CANFIELD.

Viardot-Garcia, MICHELLE PAULINE: opera-singer; b. in Paris, July 18, 1821; daughter of MANUEL GARCIA (*q. v.*); became proficient in modern languages and the practice of the fine arts, especially music, which she began to study when very young. She visited England, the U. S., and Mexico with her parents, returning to Europe in 1828. Having studied pianoforte-playing under Meysenberg and later under Liszt, she appeared at the concerts of her sister, Madame Malibran. After her father's death she lived in Brussels with her mother, continuing her studies, and in 1839 made her *début* in London in *Otello* and *La Cenerentola*. Her appearances in subsequent years at Paris, Vienna, St. Petersburg, and other European cities were occasions of triumph. She created the part of Valentine in *Les Huguenots* and that of Fidès in *Le Prophete*. Her voice was a mezzo-soprano, having a compass of three octaves. She retired in 1862. She has written some important compositions, including *L'Ogre*, produced at Baden, 1868, and *Le Dernier Magicien* (1869). In 1840 she married LOUIS VIARDOT (*q. v.*).

Viareggio, vēē-ăă-red'jō (anc. *Viaregium*): town; province of Lucca, Italy; on the seashore, 13 miles by rail N. N. W. of Pisa (see map of Italy, ref. 4–C). A century ago Viareggio was a small, unhealthful hamlet, containing about 300 inhabitants; now it is one of the most salubrious and frequented bathing-places of the Peninsula. This change is due to the hydraulic operations of the engineer Zendrini, who drained the stagnant pools which had poisoned the air of the neighborhood, and thereafter its advantages as a place for sea-bathing attracted attention. The accommodations for visitors are excellent, and the constant agitation of the water at this point on the coast is believed to add to the efficacy of the baths. The Ospizio Marino is a charitable establishment intended for poor children of scrofulous constitutions, and it receives from 400 to 500 every season. There is considerable activity in the docks of Viareggio, but the land here is said to advance on the sea at the rate of 6 feet a year from the deposits of the Arno, Serchio, and Magra. Pop. 9,570. The baths are annually visited by about 10,000 strangers. Revised by M. W. HARRINGTON.

Viat'icum [= Lat., traveling-money, provision for a journey, liter., neut. of *via'ticus*, pertaining to a journey, deriv. of *via*, way, journey]: in the Roman Catholic Church, the Eucharist as administered to a dying person. If life be prolonged, the viaticum may be repeated from time to time, if so desired by the sick person, provided the mental faculties are preserved. In the early Church the term was applied both to baptism and the Lord's Supper, and sometimes even to absolution and reconciliation. J. J. KEANE.

Viat'ka, or **Vyatka**: a northeastern government of European Russia; bounded by Vologda, Perm, Ufa, Kazan, Nijni-Novgorod, and Kostroma. Area, 59,117 sq. miles. The Kama and Viatka are navigable streams. The eastern part is occupied by spurs of the Ural Mountains, the other parts are level or undulating. Lakes and marshes are numerous; three-quarters of the area are covered with forests of fir, pine, and birch. The soil is fertile, especially in the southern valleys, producing rye, barley, oats, buckwheat, and potatoes. Cattle-breeding and horse-raising are largely carried on. The manufactures include iron, chemicals, glass, soap, cotton, and paper; timber and other raw produce are exported. Pop. (1897) 3,082,615, more than 80 per cent. Great Russians, the rest aborigines, Tartars, and about 100,000 Mohammedans. HERMANN SCHOENFELD.

Viatka: capital of the government of Viatka; on the Viatka, a tributary, through the Kama, of the Volga, 280 miles N. E. of Nijni-Novgorod (see map of Russia, ref. 6–G). It has several educational institutions, insignificant manufactures, but carries on an active trade in grain, leather, tallow, soap, wax, timber, iron, and furs. There are eighteen churches (among them a cathedral with an altar of solid silver), a gymnasium, and a seminary. Pop. (1888) 25,702. H. S.

Viaud, LOUIS MARIE JULIEN: See LOTI, PIERRE.

Vĭazem'skiĭ, PETR ANDREEVICH, Prince: writer; b. in Moscow, Russia, July 24 (N. S.), 1792. Shortly after graduating at the University of Moscow he served in the defense of his country against Napoleon, and was present at the battle of Borodino, where he had two horses killed under him. In 1824 he became an editor of the Moscow *Telegraph*, and in the following years he was intimate with the brilliant circle of which Pushkin was the center. In 1846 he entered the Government service; in 1855 was made assistant of the Minister of Public Education. D. Nov. 10, 1878. While still a child he wrote verses and began an active literary career that

lasted nearly seventy years. As a poet he showed graceful fancy, with fine command of language; as a satirist he attacked with great skill and success the prevailing absurdities of his time. He also wrote critical essays on literature. His complete works (10 vols.) were published in Moscow in 1889. A. C. COOLIDGE.

Vibert, vēē'bār', JEHAN GEORGES: genre-painter; b. in Paris, Sept. 30, 1840; pupil of Picot and Barrias; received medals at the Salons of 1864, 1867, and 1868, and a third-class medal at the Paris Exposition of 1878; became officer of the Legion of Honor 1882. He is fond of painting priests and Spanish scenes, and his pictures are often satirical. He is an excellent technician, and his drawing is correct and exact in detail, but his color is sometimes crude. *The Grasshopper and the Ant* (1875); *Committee on Moral Books* (collection of Mrs. W. H. Vanderbilt, New York); *Spanish Diligence Station* and *The Missionary's Story* (1883) are among his best-known works. He paints cleverly in water-colors. His studio is in Paris. WILLIAM A. COFFIN.

Vi'borg: one of the oldest towns of Denmark, on a small lake nearly in the center of Jutland. It has a cathedral, carries on some manufacturing industry on a small scale, and has a general trade. Pop. (1890) 8,352.

Vibration: the rapid reciprocating movement consequent upon the tendency of a body, or parts of a body, disturbed from a position of equilibrium, to recover that position again; such are the rapid motions of a tuning-fork or tightened string. Sound is due to the vibrations of air, etc., while light is due to vibrations of ether. See ACOUSTICS, LIGHT, and WAVES.

Vi'broscope [Lat. *vibra're*, vibrate + Gr. σκοπεῖν, view, observe]: an instrument, invented in 1840 by Duhamel, for registering the vibrations of a sounding body graphically on smoked paper. See also STROBOSCOPE.

Vibur'num [= Lat., wayfaring-tree, which belongs to this genus]: a genus of shrubs and trees of the family *Caprifoliaceæ*. It includes about eighty species, mostly natives of the north temperate zone, some occurring in the Andes of South America, and a few in the West Indies and Madagascar. They have opposite, simple leaves, corymbose or thyrsoid inflorescence, rotate or short-tubular corolla, five stamens, one to three celled ovary, and solitary ovules. About a dozen species are natives of the U. S., including *V. prunifolium* (black haw) and *V. lentago* (sheep-berry), both with sweetish edible berries, and *V. opulus* (the cranberry-tree), with sour edible berries. A cultivated form of the last named is the well-known SNOWBALL (*q. v.*). Several species are in common cultivation as ornamental shrubs. CHARLES E. BESSEY.

Vicar: See PARSON.

Vicar-apostolic: a person generally in episcopal orders, of some see *in partibus infidelium*, who holds from the pope episcopal authority over a district known as a vicariate-apostolic, usually an inchoate, new, and temporary, or a disordered and suppressed diocese. Missionary dioceses are usually vicariates-apostolic, and as such must report to the College of the Propaganda. In 1838 the difficulties between the King of Portugal and the pope with regard to the East Indian bishoprics led to the abolition of nearly all of them, and the substitution of vicariates-apostolic.

Vicar-capitular: the administrator of a diocese, chosen by the chapter in case of a vacancy. He can perform acts for the government of the diocese, but has no episcopal authority.

Vicar-forane [Lat. *vica'rius*, vicar + Late Lat. *fora'neus*, situated outside, rural, liter., situated out of doors]: the delegate of a bishop who exercises certain episcopal rights in a part only of the diocese. (See VICAR-GENERAL.) Not all dioceses possess such officers. They do not exist in the Roman Catholic dioceses of the U. S. J. J. K.

Vicar-general: an officer under a bishop, who as the representative of his superior exercises authority in all parts of the diocese. Every Roman Catholic bishop is expected to appoint a vicar-general, and some dioceses have two or more. Sometimes the jurisdiction is divided, and one vicar-general is appointed for spiritual, another for temporal matters. J. J. K.

Vicars, JOHN: preacher and author; b. in London, England, in 1582; educated at Christ's Hospital, London, and Queen's College, Oxford; was for many years an usher of Christ's Hospital, a Presbyterian preacher, and a violent writer on religious and political subjects. He was the author of *Jehova Jireh, God in the Mount; or, England's Remembrancer* (1641); *God's Arke overtopping the World's Waves* (1646); and *The Burning Bush not Consumed* (1646), which were published together under the title of *Magnalia Dei Anglicani, or England's Parliamentary Chronicle* (1646); a curious book on *Prodigies and Apparitions* (1643); *England's Worthies* (1647); and other works. D. in 1652.

Vice-admiral: formerly the second in rank of the line officers in the U. S. navy. This rank, as well as that of admiral, was created in 1864 as a reward for war service, and was held by David D. Porter and Stephen C. Rowan. The vice-admiral's pay at sea was $9,000 a year, on shore duty $8,000, and while awaiting orders $6,000. The offices of vice-admiral and admiral in the U. S. navy were abolished by the operation of law when the places became vacant by death. The distinction that prevailed in the British navy of vice-admirals of the red, the white, and the blue, has been abolished. See ADMIRAL.

Vicente, vēē-sen't*ā*, GIL: the founder and most noted representative of the Portuguese drama; b. in 1470. He was in the service of Queen Leonora, widow of John II., first as a goldsmith highly esteemed for his fine artistic work, then from 1493 also as poet of the court. In the latter capacity he composed, between the years 1502 and 1536, a considerable number of dramatical plays, of which only forty-two have been preserved, consisting of religious pastoral plays, comedies, and festival plays. Though they plainly show the influence of Juan de la Encina, the father of the Spanish drama, they are far superior to the latter's works, both for originality of invention and for artistic merit. Inasmuch as Vicente wrote more than half of his plays in Spanish, which was the favorite language of the Portuguese court, he deserves a prominent place in the history of the earlier Spanish drama, upon which he no doubt exercised considerable influence, his works being known and performed in Spain as well as in Portugal. Gil Vicente's plays are thoroughly national in character, embodying the poetical forms, the ideas, and traditions of the Portuguese people, and preserving, in the lyric poems introduced into them, valuable specimens of the oldest popular lyric poetry of the northwestern part of the Spanish Peninsula. With Camoens and Almeida-Garrett, Vicente stands foremost among the national poets of eminence that Portugal has produced. The best edition of his works is still that of Barreto Feijo and Monteiro (3 vols., Hamburg, 1834). Some valuable contributions to his biography were made by Th. Braga in the journal *O Positivismo*. D. probably at Evora between 1536 and 1540. HENRY R. LANG.

Vicenza, vēē-chent'zaä: capital of the province of Vicenza; in Northern Italy; on the river Bacchiglione and near Monte Berico; 42 miles by rail W. of Venice (see map of Italy, ref. 3–D). Vicenza is known for its palaces constructed by Palladio, a native of the town (1518–80), which, though condemned by critics and somewhat fallen into decay, are justly admired for their proportions and decorations. The cathedral has pictures and terra-cottas, and is of fifteenth century Gothic. San Lorenzo is a fine Gothic edifice with modern restorations. La Santa Corona, also Gothic, has remarkable sepulchral monuments. There is a good collection of pictures in the magnificent Pinacoteca Civica. The sanctuary on Monte Berico is approached by an arcade of 168 arches, contains some good pictures, and is visited for the sake of its beautiful view, which embraces a wide range of Alpine peak and fertile plain. At the foot of Monte Berico is the stripped and mutilated villa of Palladio, once one of the most splendid monuments of modern architectural art, and still retaining its fine proportions and most important features. Vicenza is well provided with educational institutions, and has manufactures of silk, linen, earthenware, and paper. Pop. 27,700. Revised by M. W. HARRINGTON.

Vicenza, DUKE OF: See CAULAINCOURT, ARMAND AUGUSTIN LOUIS, de.

Vice-President: an officer of the U. S. Government, chosen at the same time and in the same manner as the President. (See the article CONSTITUTION, Twelfth Amendment.) His only official duty is to preside over the Senate. In case of a failure of the electors to choose a Vice-President, a majority of the votes of the Senators (a quorum of two-thirds being present) will elect him; or if there be no majority, he is chosen from the two candidates who have

received the highest number of Senatorial votes. In case of a vacancy in the presidency he becomes President of the U. S. As president of the Senate he has a casting vote in case of a tie. His salary is $8,000 a year.

Vich, or **Vique**, veek: town; province of Barcelona, Spain; at the foot of the Pyrenees, 40 miles N. of Barcelona (see map of Spain, ref. 13–K). It has cotton and flax-weaving factories, tanneries, potteries, and other manufactures; its sausages are well-known. The cathedral, begun in 1040, with alterations made in the eighteenth century, has fine Gothic cloisters. Pop. (1887) 11,640.

Vichy, vee'shee': town; department of Allier, France; on the Allier, nine hours by rail from Paris (see map of France, ref. 6–G). It is beautifully situated, and is celebrated for its mineral springs and bathing establishments. The mineral waters are both hot and cold, and are alkaline, containing chiefly sodium carbonate. They are charged with carbon dioxide. The waters are valued for diseases of digestion, and about 2,250,000 bottles are shipped annually. The celebrity of the place dates from the times of the Romans, but its modern reputation resulted from the visits made to it by Napoleon III. Pop. (1891) 10,605, which is increased to 40,000 during the season.

Vicksburg: city (founded in 1826); capital of Warren co., Miss.; on the Mississippi river near its junction with the Yazoo, and on the Queen and Cresc. Route and the Yazoo and Miss. Val. Railroad; 45 miles W. of Jackson, the State capital, and 235 N. W. of New Orleans (for location, see map of Mississippi, ref. 7–E). The city forms an irregular parallelogram of 1½ sq. miles, and occupies the summit and slopes of a lofty range of hills. The site is highly picturesque, and the city has many fine drives, including one to the National Cemetery, where 17,000 Union dead are buried. Among the public buildings the U. S. Government building and the county court-house are imposing edifices. There are 7 churches for white people—2 Protestant Episcopal, 2 Methodist Episcopal, a Roman Catholic, a Baptist, and a Presbyterian—and several for Negroes. The public-school system comprises a high school and 3 grammar school buildings, property valued at over $35,000, an enrollment of over 2,000 pupils, and an annual revenue of over $25,000. There are 2 Roman Catholic parochial schools, liberally endowed and with fine buildings, St. Francis Xavier's Academy, and St. Aloysius's commercial college. The principal benevolent institution is the Charity Hospital, maintained at an annual cost of $12,000.

The city is lighted with gas and electricity, and has an improved system of water-works, affording an abundant supply under high pressure. The annual revenue is about $150,000; expenditure, $145,000; total debt, $517,000; and assessed valuation (one-half actual value), about $5,000,000. There are 2 national banks and 3 State banks with combined resources of $2,525,000. The city has a board of trade and a cotton exchange, both influential bodies. About 60,000 bales of cotton are here shipped annually, besides large quantities of lumber, cottonseed oil and cake, and general produce. There are extensive railway-shops, 3 cotton-oil mills, and many smaller industries.

Vicksburg suffered severely during the civil war. In 1876 the river cut through a neck of land, leaving the city on an inland lake. Since then the U. S. Government has been carrying on operations to divert the Yazoo river past the city and to restore the harbor, at an estimated cost of $1,250,000. Pop. (1880) 11,814; (1890) 13,373; (1900) 14,834. J. F. BATTAILE.

Vicksburg, Campaign and Siege of: military operations which took place during the civil war in the U. S. After the capture of New Orleans (Apr., 1862) Vicksburg was the only strong point on the Mississippi held by the Confederates. It was well provided with batteries on the river front and along the Yazoo up to Haines's Bluff. Subsequently a continuous line of works was constructed in rear of and surrounding the city. On May 18, 1862, Flag-Officer Farragut, coming up the river, demanded the surrender of Vicksburg, which was refused. He returned on June 26 with Flag-Officer Porter's mortar flotilla, whereupon the bombardment of the city began and was continued until about July 22. On June 28 Farragut ran past the batteries with two ships and five gunboats, and on July 1 was joined above the city by Capt. Charles H. Davis with his fleet, which had come down from Memphis. A land force under Gen. Thomas Williams, of about 3,000 men and 1,200 Negro laborers, was meanwhile trying to cut a canal, for the passage of gunboats and transports, across the peninsula opposite Vicksburg; but before its completion a rise in the river destroyed all that had been done. On the night of July 15 Farragut's fleet ran down past the batteries, engaging them and the ram Arkansas on the way, and on July 27, having taken Williams's troops on board, withdrew to Baton Rouge and New Orleans. On the same day Davis's fleet went up the river to Helena, and the first attack was ended. The Confederate reports state that comparatively little damage was done by the bombardment. On Nov. 26, 1862, Gen. Grant started from Grand Junction, intending to advance along the Yazoo and attack Vicksburg from the rear; but on Dec. 20 Gen. Earl Van Dorn captured his dépôt at Holly Springs and compelled his withdrawal. Gen. William T. Sherman, however, starting from Memphis on Dec. 20, moved down the river and on the 29th assaulted Chickasaw Bluffs, but was repulsed with much loss by Gen. John C. Pemberton, who was in command at Vicksburg. Sherman withdrew to Millikin's Bend, and was relieved by Gen. McClernand, Grant subsequently taking command in person. Grant, wishing to get a footing on the high ground in the rear of Vicksburg which touches the river below the city, made an attempt to cut a canal near the one previously begun by Williams, and afterward tried to find a water-route through the bayous, lakes, etc., on both the right and left banks of the river, by which he could move his army, on transports, below or in rear of the city. He failed in all these, but as the river fell enough to make the roads passable, he marched his army by land on the right bank to De Schroons, where on Apr. 30 it embarked on the fleet which under Porter had run down past the batteries of Vicksburg on Apr. 16, and bombarded Grand Gulf Apr. 29. Grant moved down the river, landed at Bruinsburg, and marched toward Jackson, severing his connection with the river on May 11. The battle of Raymond was fought and won on the 12th. Jackson was captured on the 14th, and the battles of Champion Hill and Big Black River were won on the 16th and 17th respectively. On the 18th Grant was in front of Vicksburg with his communications re-established. On the 19th he made an assault which gave him a better position, and on the 22d a general assault was made which was repulsed with great loss. The regular siege then began and continued until the city surrendered on July 4, 1863. The total force surrendered by the Confederates was over 31,000 men and 172 guns; their previous losses during the campaign and siege exceeded 10,000 men and 90 guns. Grant's total losses in this campaign and siege were about 10,000 men; his total force near Vicksburg was between 60,000 and 70,000 men. The fall of Vicksburg was followed on July 9th by that of Port Hudson. This opened up the Mississippi, and on July 16th the steamer Imperial arrived at New Orleans from St. Louis. Although the banks of the river were at times occupied by guerrillas and cavalry raiders, no serious interruptions to its commerce were caused by the Confederates after this date, and the Confederate States on the west were separated from those on the east up to the close of the war. JAMES MERCUR.

Vico, vee'kō, FRANCESCO, di: astronomer; b. at Macerata, Naples, May 19, 1805; was director in 1839 of the observatory of Rome; discovered several comets, and acquired celebrity by his observations of the spots of Venus; was expelled with the other Jesuits from Rome in 1848; died in London, Nov. 15, 1848. Revised by S. NEWCOMB.

Vico, GIOVANNI BATTISTA: jurist, philosopher, and critic; b. in Naples, June 23, 1668; was educated by the Jesuits; studied law; lived for several years in the house of the Bishop of Ischia as tutor to one of his nephews; was appointed Professor of Rhetoric at Naples 1697, and in 1735 royal historiographer. D. in Naples, Jan. 20, 1744. His great work, *Principi di una Scienza Nuova d'intorno alla Comune Natura delle Nazioni*, appeared at Naples in 1725, and in enlarged editions in 1730 and 1745. It represents Divine Providence as the governing power in the history of mankind, and demonstrates the formation, development, and decay of nations as realizations of ideas pre-existing in the Divine Mind. It is often obscure, but it is as often bold and striking, anticipating the results of later researches; and it exercised great influence when, in the beginning of the nineteenth century, it became thoroughly known in Europe, introduced in Germany by Weber, in France by Michelet. Complete editions of his works were published by Villa Rosa (1818) and Ferrari (1834). See Flint's *Vico* (Edinburgh and London, 1884). Revised by S. M. JACKSON.

Vico Equense, -ā-kwen'sā (anc. *Vicus Æquensis*): town; province of Castellamare, Southern Italy; about 4 miles S. W. of the town of Castellamare; on a rocky cliff that overlooks the Bay of Naples and commands magnificent views of Vesuvius, Naples, and the neighboring islands. It was built by Charles of Anjou about 1300, and was afterward a favorite resort of the Aragonese princes, but the numerous remains of ancient constructions found near it prove that it once had a dense population. Vico Equense is noted for its wines and rich fruits. Pop., with commune, 10,940. Revised by M. W. HARRINGTON.

Victor [= Lat., liter., conqueror, victor, deriv. of *vincere*, *vic'tum*, conquer]: the name of three popes. VICTOR I. reigned, according to some, 185–197; according to others, 187–200, or 190–202. He was an African by birth, and showed something of the temper of his native climate in the paschal controversy, threatening to excommunicate all bishops who would not accept the Roman computation of Easter. The harshness of such a measure was condemned by many Western bishops, and he was finally induced by Irenæus to refrain from carrying it out. The epistle of the latter concerning the case has been preserved by Eusebius. Pope Victor was also involved in the Monarchian controversy and excommunicated Theodotus, the leader of the Monarchians.—VICTOR II., a German whose real name was Gebhard, reigned 1055–57, was a relative and intimate friend of Henry III., and Bishop of Eichstädt before his election to the papal see, but accepted nevertheless the ideas of Hildebrand concerning simony and the marriage of priests, holding several councils against these practices.—VICTOR III. (1086–87) was abbot of Monte Cassino when the dying Gregory VII. recommended him to the cardinals as his successor. A year elapsed, however, before he consented to accept the election. During the half year of his pontificate he was faithful to the spirit of Gregory's policy.—Two antipopes have borne the name of VICTOR IV., but neither was of much importance. Revised by F. M. COLBY.

Victor, AURELIUS: See AURELIUS VICTOR.

Victor, CLAUDE PERRIN, Duke of Belluno: general; b. at Lamarche, department of Vosges, France, Dec. 7, 1764; entered the army in 1781; was created a brigadier-general in 1793 for bravery at the siege of Toulon, general of division in 1797, marshal and duke after the battle of Friedland, and after the Treaty of Tilsit, governor of Berlin; commanded in Spain from 1809 to 1812, where he gained the victories of Ucles and Medellin, but was defeated at Talavera; fought with distinction in the Russian and German campaigns 1812–14; adhered to the Bourbons during the Hundred Days, and became afterward conspicuous on account of his harshness toward those generals who returned to Napoleon; was Minister of War from 1821 to 1823; accompanied in the latter year the French army to Spain as commander under the Duke of Angoulême, but was recalled on account of suspected connivance at the fraudulent contracts obtained by Ouvrard for supplying the army. He was major-general of the Royal Guard at the time of the Revolution of 1830, but afterward lived in retirement. D. in Paris, Mar. 1, 1841.

Victor, CLAUDIUS MARIUS: Christian poet of the fifth century; b. in Marseilles. His poem entitled *Alethia*, in three books, is a rendering into verse of the first nineteen chapters of Genesis, interspersed with various reflections and digressions, showing considerable power of imagination and expression. The best edition is by C. Schenkl (Vienna, 1888). M. W.

Victor Amade'us, the name of three sovereigns of the house of Savoy, of whom the first bore the title of Duke of Savoy, the last two that of King of Sardinia. VICTOR AMADEUS I., b. May 8, 1587, succeeded his father, Charles Emmanuel the Great, as Duke of Savoy in 1630; was forced by Richelieu into an alliance with France against Austria and Spain; gained the victories of Fornavento and Montebaldone, but died at Vercelli, Oct. 7, 1637.—VICTOR AMADEUS II., b. May 14, 1666, a grandson of the preceding, succeeded his father, Charles Emmanuel II., in 1675, and married in 1684 Anne Marie of Orleans, a niece of Louis XIV. Nevertheless when Louis sought to reduce Savoy to the position of a vassal state, Victor Amadeus joined the Augsburg League against him, and although Catinat overran both Savoy and Piedmont after the battle of Marsaglia (Oct. 4, 1693), in which the duke lost 10,000 men, he still kept up the contest, and compelled Louis XIV. to buy him off by returning to him important territories and paying a handsome sum of money. After the peace his eldest daughter was married to the Duke of Burgundy, by whom she became mother of Louis XV., and the younger to Philip of Anjou, afterward King of Spain. In the Spanish war of succession, however, the duke allied himself again with Austria. His country was the scene alternately of the exploits of Eugene and Vendôme, but by the Peace of Utrecht (1713) he recovered all his possessions, and in addition received Sicily and the title of king. In 1720 he exchanged Sicily for Sardinia, and on Sept. 2, 1730, abdicated. Next year he made an attempt to regain the royal power, but was imprisoned at the château of Moncalieri, where he died Oct. 31, 1732.—VICTOR AMADEUS III., b. June 26, 1727, a grandson of the preceding, succeeded his father, Charles Emmanuel III., in 1773; declared war against the French republic, but was compelled by Scherer and Bonaparte to accept the Peace of Paris (1796), by which he lost Savoy and Nice. D. Oct. 16, 1796.
Revised by F. M. COLBY.

Victor Emmanuel I.: King of Sardinia (1802–21); b. July 24, 1759, the second son of Victor Amadeus III.; ascended the throne on the abdication of his brother, Charles Emmanuel IV., June 4, 1802, and resided at Cagliari till 1814, his possessions on the mainland being occupied by the French. By the Congress of Vienna his hereditary lands were restored to him, and the duchy of Genoa was added to his dominions; but the reactionary measures he introduced caused a violent revolution, and he abdicated Mar. 13, 1821, in favor of his brother Charles Felix. D. at Moncalieri, Jan. 10, 1824.

Victor Emmanuel II.: King of Sardinia from 1849 to 1861, and thereafter King of Italy; b. at Turin, Mar. 14, 1820, the eldest son of Charles Albert; received an excellent education, both scientific and military; married (Apr. 12, 1842) Archduchess Adelheid of Austria; commanded the Savoy brigade in the campaigns against Austria in 1848–49, and distinguished himself by his brilliant personal valor in the battles of Goito and Novara. On the very evening of the disastrous battle of Novara (Mar. 23, 1849) Charles Albert abdicated in favor of his son, and Victor Emmanuel ascended the throne under very critical circumstances. Peace had to be bought of Austria with great pecuniary sacrifices, and in the interior the state was divided into many contending political factions. The young king himself was as yet by no means popular. As the husband of an Austrian princess and a pupil of the Jesuits he had to earn the confidence of his subjects. Nevertheless, from the very first day of his reign the policy which he adopted, and which he invariably pursued, though at times it led him into very strange combinations, tended toward the establishment of the national unity of Italy and the elevation of the Italian people through free institutions. Supported by his celebrated minister CAVOUR (*q. v.*), he succeeded in restoring the finances to order, reorganized the army, concluded commercial treaties with foreign powers, limited the privileges of the clergy, secularized the Church property, and established a system of popular education independent of the control of the Church. The pope excommunicated him, but all intelligent men in Italy began to look on him as the coming liberator, the more so that he with great boldness gave all political refugees from the other Italian states an asylum in his dominions. By his participation in the Crimean war he secured for the kingdom of Sardinia a recognition as part of the political system of Europe, and finally, in 1859, he was able to renew the contest with Austria by the aid of France. By the Treaty of Villafranca (July 11) and the Peace of Zurich (Nov. 10, 1859) Lombardy was added to his dominions. The aid of France was secured at the cost of Savoy and Nice, and in spite of Napoleon's promises Venetia still remained an Austrian province; but at the same time Parma, Modena, Tuscany, and parts of the Papal States annexed themselves to Sardinia; and soon afterward the campaign of Garibaldi in Sicily and Naples produced the same result with respect to the whole southern part of Italy. On Mar. 17, 1861, Victor Emmanuel assumed the title of King of Italy, and early in 1865 the royal residence was removed from Turin to Florence. Meanwhile the situation continued to be very difficult. Venetia and Rome were still wanting, and great success had at once made the Italian people very impatient and the relation to other powers, even to France, very delicate. As France was not likely further to support the Italian movement, Victor Emmanuel sought and found an ally in Prussia; and although the Italians lost the battle of Custozza (June 24, 1866), by

the Peace of Vienna (in October) Austria ceded Venetia. When, during the Franco-German war, the French garrison was withdrawn from Rome, the city annexed itself by a popular vote to Italy, and on July 2, 1871, Victor Emmanuel entered the city and took up his residence in the Quirinal Palace. By his first wife (d. Jan. 20, 1855) he had two sons—Humbert, his successor, and Amadeus, for a time King of Spain; and two daughters—Clotilde, married to Prince Napoleon, and Pia, married to the King of Portugal. He married, morganatically, Rosa Vercellana, Countess of Mirafiore. D. in Rome, Jan. 9, 1878.

Revised by F. M. Colby.

Victor Emmanuel III.: See the Appendix.

Victoria: a British colony occupying the southeastern part of Australia; the first of the seven Australasian colonies in density of population, the fourth in order of establishment, and the sixth in area; triangular in form, with the apex at Cape Howe, and the base on the meridian of 141° E.; separated from New South Wales by the Murray river. Area, 87,884 sq. miles.

Coasts.—The coast-line is about 800 miles long, and there are few islands. Wilson's Promontory, the southernmost point of Australia, separates the waters of the Pacific from those of the Southern or Indian Ocean, and divides the coast-line of Victoria into two nearly equal but dissimilar parts. To the E. is a long, gentle sweep of low sandy shores, backed by low sandhills, behind which is a series of lakes and coastal lagoons, accessible to commerce only with difficulty and danger. The coast W. of Wilson's Promontory is divided by Cape Otway, the terminus of a bold mountain range, whose heavily timbered capes rise directly from the water. Nearly midway between the two capes is the narrow entrance of Port Phillip Bay, giving admission to Melbourne on the Yarra Yarra river, 4 miles from the head of the bay. The bay is about 40 miles long by 30 broad, and has abundantly deep water and several ports on its shores. Melbourne, the capital of the colony, is accessible to vessels drawing 19 feet of water. E. of Port Phillip Bay is Western Port, a large shallow bay, half filled by Phillip and French islands, and of little use for navigation. W. of Cape Otway the coast is generally bold.

Surface.—The eastern part is mountainous, with plains along the coast, and the western part is an extended plain. The Australian Alps enter the colony near the head of the Murray river, coming from New South Wales, where they culminate. The highest point in Victoria is Mt. Bugong, 6,508 feet, and there are nearly a score of peaks with elevations of more than 5,000 feet. It is a wild complex of ranges, generally covered with dense vegetation, including the enormous tree-growths for which Victoria is famous, for the most part nearly impassable, and to a great extent still unexplored. These mountains produce a series of plateaus whose elevation gives them a more temperate climate than belongs to the latitude, and which form attractive agricultural lands where not too wild for settlement. Westward from the Alps extends the Dividing Range, 1,500 to 3,000 feet high, passing in the western part of the colony into the Australian Pyrenees, and terminating in several cross-ranges, of which the Grampians are the last and highest (Mt. William, 3,600 feet). To the S. of the Pyrenees are the mountains of Cape Otway, wild and picturesque, reserved by the state because of their forests. The western plains are slightly undulating, with open, grassy timberlands in the S., but in the N. flat, dry, often sandy, in some places bare, in others covered with a dense scrub.

Rivers.—The mountains just described form the watershed between the Murray basin and the direct coast drainage. The Murray River (*q. v.*) is the principal stream of Australia. On the Pacific versant the most important stream is the Snowy river (300 miles long, 180 in Victoria). Farther W. a series of smaller streams drain the fertile Gippsland and terminate in the littoral lakes and lagoons already mentioned. The next largest coast river is the Glenelg (280 miles long), in the extreme west of the colony. The Victorian streams generally vary much with the season, and are subject to heavy annual overflows.

Climate.—In temperature and rainfall Victoria much resembles Central California. The worst season is the summer, when the heat is sometimes excessive, due to hot northerly winds, lasting only a day or two. The most agreeable season is the autumn. The mean temperature of Melbourne is 57° F.; the highest observed in the shade 111°, and the lowest 27°. The rainfall is greater in the E., and decreases to the N. W.; it is greatest on the table-lands (40 inches), and falls to 10 inches or less on the lower Murray. Snow is common in the mountains, but very rare at sea-level, and has been observed only twice at Melbourne. The average annual rainfall at Melbourne is 25 inches.

Flora and Fauna.—The dominating forest forms are the gum-trees of the genus *Eucalyptus*, and the *E. amygdalina* in the mountains attains an enormous size, surpassing the big trees of California. In some districts the trees are said to average 300 feet in height. The largest recorded is one found prostrate, which measured 470 feet in length, and 81 feet in girth near the roots. These trees have a white, slender, smooth trunk, running up 60 or 70 feet to the first branch, and a forest of them has a singular and beautiful appearance. There are many species of *Eucalyptus*, and they vary greatly in size and in qualities. The dense "mallee" scrub, which covers many thousand acres in the N. W., is formed by the *E. dumosa*. The blue-gum is the species now generally introduced into warmer America and Europe. The red-gum, or "hardwood," makes a highly prized lumber, because it is almost unaffected by atmospheric humidity or fresh or salt water. The myrtle family has many other species, and other characteristic plants are acacias, casuarinas, and tree-ferns.

The native mammals are of the Australian marsupial type—the kangaroo, wallaby, wombat, bandicoot, and opossum. The birds and reptiles are numerous, and some species of the latter are venomous. Many European species have been introduced, and have promptly become perfectly acclimated. The rabbit has found itself so much at home and multiplied in such prodigious numbers as to have become a serious pest. The camel has been found well adapted to the interior plains, the African ostrich seems to prosper, and the Asiatic elephant has been imported. The trout has been acclimated, and has taken possession of some of the streams.

Mining.—This colony leads the seven Australasian colonies in the production of gold, of which it has furnished nearly two-thirds of the entire Australian output, but of late years the Queensland annual production of this metal has nearly equaled the Victorian. The Victorian product in 1899 was 854,500 oz., valued at £3,418,000. The total production to the end of 1898 was 62,684,705 oz., valued at £250,738,820. The number of gold-miners in 1895 was 29,897, of whom 2,014 were Chinese. The mining was at first in surface placers, but for alluvial mining it is found necessary to sink shafts to the beds of ancient rivers. Quartz-mining is gradually taking the place of alluvial, but with increase of depth the profit is steadily diminishing. The auriferous fields of Victoria occur over the area bounded on the W. by the Avoca river and on the S. by the parallel of Melbourne. Over the area thus defined the fields are thickly distributed, and fully one-third of the colony is believed to be capable of gold production. Great discoveries of coal were announced in 1894, and it is hoped that the colony can soon furnish what is needed for her own consumption. The deposits of iron have attracted some attention, and small quantities of other minerals are found.

Agriculture.—About 20 per cent. of the colony is considered suitable for tillage, and 28 per cent. for grazing. Only about 5 per cent. of the entire acreage has been alienated. The number of cultivated holdings in 1899–1900 was 40,160. The chief crops, in the order of their importance and with the yield to the acre, for 1899 were: Wheat, 9·09 bush.; hay, 1·28 tons; oats, 20·75 bush.; barley, 23·5 bush.; potatoes, 3·91 tons. Tobacco is cultivated to a considerable extent. In 1900 the vine covered 27,550 acres, and though the phylloxera has been introduced, the wine product was in considerable quantity and fine quality. The fruits of Europe have been introduced, and most of them are productive.

On Mar. 31, 1894, the colony was estimated to possess 463,903 horses, 1,817,291 horned cattle, 13,098,725 sheep, and 328,162 swine. Victoria is the most closely stocked of the seven colonies. Its wool brings a higher price than that of the others, and it devotes more attention to dairy products than any other except New Zealand.

Extensive districts of the colony do not receive sufficient rainfall for agriculture, and irrigation has been extensively tried by private enterprise, especially in the basins of the Goulburn, Loddon, Wimmera, and Avoca rivers. The most successful irrigation settlement is that of Mildura, in the Swan Hill district, on the Murray river, just below the Loddon. This was a desert and valueless tract until water was brought on it (from the Murray), when it was found to be

of extraordinary fertility. The settlement has (1894) about 3,500 inhabitants, devoted especially to the raising of grapes and manufacture of raisins. Its success has been noteworthy, but the expenditure required was very great.

Population.—The estimated population on June 30, 1896, was 1,177,444. At the census of Apr. 5, 1891, there were found 598,414 males and 541,991 females. In 1893 there were 36,552 births (of which 1,997 were illegitimate), 16,508 deaths, and 7,004 marriages. Of the population in 1891 63 per cent. were born in Victoria, 7 per cent. in other Australasian colonies, and 26 per cent. in the United Kingdom. The Chinese numbered 9,377, materially less than at the preceding census. The aborigines are of the Australian race. On the arrival of the first colonists they were variously estimated at from 6,000 to 15,000. In 1851 they numbered 2,693; in 1871, 1,330; in 1881, 780; in 1891, 565.

About five-ninths of the population are in the towns, and in 1893 about two-fifths were in Melbourne. From 1838 to 1874 167,000 immigrants received aid from the public funds, but state-aided immigration ceased in the latter year. In 1899 there were 85,384 immigrants and 86,948 emigrants, a surplus of 1,564 of the latter. There is no state church, and no assistance from public funds is given to religious institutions. The Anglican Church embraces 37 per cent. of the population, other Protestant sects 38 per cent., Roman Catholic 22 per cent. Education is entirely secular, and primary education compulsory. There is a full complement of schools of all grades, and the percentage of illiteracy for all over 14 years of age is 2·3. Melbourne University is both an educational and examining body, with power to grant all degrees except in divinity. It was opened in 1855, and receives annually £13,750 from the public funds. It had 691 students in 1899. The public library at Melbourne has about 512,000 volumes and pamphlets, and at the beginning of 1893 there were in the colony 419 other public libraries, with an aggregate of about 560,000 volumes. In 1895 Melbourne had a population of 447,565; Ballarat, 45,336; Sandhurst, 42,381; Geelong, 24,575. No other town had 10,000 inhabitants.

Commerce.—Imports are subject to a heavy tariff, averaging in 1899 about 11½ per cent. of their value. The total imports for that year (including bullion and specie) amounted to £17,952,844, an increase of £1,184,710 over 1898, and of £2,498,412 over 1897. The chief articles of import are wool and woolen goods, cottons, sugar, coal, tea, live stock, timber, iron, and steel (in the order of importance). Nine-tenths came from the United Kingdom and the other colonies, about one-half from each. Less than 3 per cent. came from the U. S. The value of the exports was £18,567,780, an increase of £2,695,534 over 1898. About half the exports go to Great Britain. The staple exports are wool (about £6,000,000 annually, but a part is from New South Wales) and gold (about £4,000,000 annually). Next in importance are wheat and its products, tallow, leather, and preserved and frozen meats. The value of the last has fallen off largely.

The registered shipping in 1899 consisted of 381 craft (148 steamers), aggregating 98,801 tons burden. In 1899 2,024 vessels entered and 2,031 cleared from the ports of the colony. About 1,600 of these vessels entered and cleared at Melbourne.

The railways belong to the colony, and the network is the most complete of the seven colonies, besides connecting Melbourne with Sydney and Adelaide. On June 30, 1899, 3,160 miles of railway had been completed at a total cost of £38,974,410, nearly all borrowed money. The net profit for the year ending at that date was £1,076,003, or enough to pay 2·98 per cent. on the borrowed capital, drawing an average of nearly 4 per cent. There were 6,747 miles of telegraph line with 15,125 miles of wire; also 13,591 miles of telephone wire with over 4,400 telephones.

A branch of the royal mint was established at Melbourne in 1872, and from this down to the end of 1899 £88,705,676 worth of coin and bullion had been issued. Silver and bronze money are not issued here. During the last quarter of 1899 there were eleven banks of issue in the colony, with note circulations aggregating £951,794.

Administration.—The constitution dates from 1854. The legislative power rests in a parliament of two chambers—the legislative council, of 48 members, from whom a property qualification is required, elected for six years by special electors with either property or educational qualification; and a legislative assembly, of 95 members (1900), elected for three years without special qualification by general suffrage of adult males. Clergymen are ineligible to either house. The executive power is vested in a governor appointed by the crown, and assisted by a cabinet of ten responsible ministers. Local government is representative, and ratepayers have a number of votes gauged by the rates paid.

The public revenue for the year ending June 30, 1899, was £7,396,944 and the expenditure £7,014,706, in both cases less than for the preceding year. The revenues are derived from the railways, the post, the telegraphs, from crown lands, and from taxation. The taxes include customs, excise, inheritance fees, stamp-duty, land-tax, etc., named in the order of their capacity for producing revenue. The chief expenditure is in payment of interest and other expenses due to the public debt. This on June 30, 1900, was £48,774,885, bearing an average interest of nearly 4 per cent. It was nearly all incurred for railways and other public works. The land force at the end of 1899 consisted of 5,899 men, of whom 393 were permanent, 3,404 militia, and the rest volunteers. The navy consisted of 1 ironclad, and 2 first-class and 3 second-class torpedo-boats.

History.—Colonization began in 1826; Melbourne was founded in 1836; and the colony was erected at the expense of New South Wales in 1850. The discovery of gold in paying quantities in 1851 led to an enormous influx of population. Except for a somewhat painful recovery from the attack of "gold fever," the colony progressed steadily for the next forty years without especially noteworthy incidents, becoming eventually the leading colony in density of population and in wealth. The financial and commercial distress following 1891, which was more keenly felt in Australia than most other parts of the world, especially distressed Victoria, and most of all Melbourne, where there had been a systematic course of booming of real estate. As a result, increased attention has been directed to the colony's natural resources. For Federation see AUSTRALIA.

REFERENCES.—Hayter, *Report on the Census of 1891* (1893) and *Victorian Handbook* (occasional); Jenks, *Government of Victoria* (1891); Langtrel, *Gold-fields of Victoria* (1889); Smith, *Aborigines of Victoria* (2 vols., 1878).

MARK W. HARRINGTON.

Victoria: capital of the British colony of HONGKONG (*q. v.*).

Victoria: capital and principal port of the state of Espirito Santo, Brazil; on a bay in lat. 20° 19′ S. (see map of South America, ref. 6–H). The harbor, surrounded by precipitous hills, is safe and good, admitting vessels of 20 feet draught. The town is beautifully situated, but is hot and somewhat unhealthful. The principal exports are coffee and sugar. Victoria was founded in 1535. Pop. about 7,000.

H. H. S.

Victoria: a town of the state of Pernambuco, Brazil; about 30 miles W. S. W. of the city of Pernambuco, with which it is connected by rail (see map of South America, ref. 4–H). It was named in honor of a victory gained there over the Dutch in 1645, and is the center of one of the richest sugar districts in the state. Pop. about 9,000.

H. H. S.

Victoria: capital of Tamaulipas, Mexico. See CIUDAD VICTORIA.

Victoria: the capital of the province of British Columbia, Dominion of Canada; at the southeast extremity of Vancouver island, on the Strait of Fuca, in lat. 48° 27′ N., lon. 123° 25′ W. (see map of Canada, ref. 8–D). It is the southern terminus of the Esquimalt and Nanaimo and the Victoria and Sidney railways, and is only 3 miles from Esquimalt. Victoria has an inner and an outer harbor, the former being shallow, while the outer can accommodate the largest Pacific steamers. The climate resembles that of the southern part of England, but is more rainy in winter and drier in summer. Winters are not severe, and snow seldom lasts more than three or four days. The city, like most English towns, is built without reference to any plan, but possesses many wide streets, the business portion being well built and the suburbs being intersected with picturesque drives lined with handsome residences. Among the finest buildings are the Provincial Legislative Assembly (built at a cost of $500,000), post-office, custom-house, supreme court-house, Government House, the official residence of the lieutenant-governor, the city-hall, the Roman Catholic Cathedral, the Protestant Orphans' Home (with extensive grounds), and the public schools. There are 5 Episcopal, 3 Presbyterian, 2 Methodist, 2 Roman Catholic, and 2

Baptist Churches. Free education requirements are provided for by 1 high school and 8 ward schools, at which the average number of pupils attending during 1894 was 2,044. These schools are maintained out of the provincial and city funds jointly at an annual cost of $50,000. Besides the above, there are 2 private colleges for boys and 3 private schools for girls. Among the charitable institutions are the Protestant Orphans' Home, the Home for the Aged and Infirm (maintained by the city), the Samaritan Home, the Refuge Home, the Provincial Royal Jubilee Hospital, erected in commemoration of Queen Victoria's "Jubilee," and now consolidated with the French Hospital and the St. Joseph's Hospital. The penal institutions consist of the city and provincial jails and a juvenile reformatory.

The financial position of Victoria on Dec. 31, 1894, was as follows: Receipts for 1894, $342,935; expenditures, $338,400; net debt due for loans raised under authority of all the various bylaws, $1,874,000, bearing average interest of about 4½ per cent., while the property assessed for payment of taxes was valued at $20,914,385, consisting of land valued at $13,774,365 and improvements $7,140,020. The city owns its own water-works and electric-light works, and its own isolation hospital for infectious diseases. There are 3 chartered banks, 1 savings-bank, and several incorporated loan and investment associations.

Among the business enterprises in the city are 4 lumber-yards, 4 sash and door factories, 2 tanneries, 4 breweries, 3 iron-foundries, 2 shipyards, 1 pottery, 4 book-binding establishments, 1 trunk-factory, 1 biscuit-factory, 2 electric-light works, 2 daily and 4 weekly newspapers, an electric tramway company operating 12 miles of road, gas-works, rice-mill, 2 flour-mills, chemical works, and 2 cold-storage warehouses. Lines of steamers ply fortnightly between Victoria and China and Japan, another line runs to Australia, a third plies bi-weekly to San Francisco, a fourth to Alaska, while there is a daily service between Victoria and New Westminster and Vancouver on the mainland of British Columbia (connecting with the Canadian Pacific Railway at Vancouver), and Seattle and Tacoma in the State of Washington.

On the confederation in 1871 Victoria ceased to be a free port, and annually contributes to the Dominion treasury $1,800,000 for import duties.

History.—Victoria was originally simply a trading-post of the Hudson's Bay Company, established in 1843. Vancouver's island was leased by the crown to the company from 1848 to 1859; at the expiration of the lease the island became a crown colony with Victoria as its capital, and when the island united with the mainland in the formation of the colony of British Columbia in 1866 Victoria became the capital of the colony and was declared the capital of the Province of British Columbia on confederation with the Dominion of Canada in 1871. It first grew into importance on the discovery of gold in Cariboo. It was the headquarters of the Pacific sealing-fleet, wherein several thousand men were employed until the industry was crippled by the promulgation of the Bering Sea regulations. The population, according to the Dominion census taken in 1891 was 16,800, while according to a city census taken later the same year it was 23,000. J. STUART YATES.

Victoria: city; capital of Victoria co., Tex.; on the Guadalupe river, and the Southern Pac. Railroad; 30 miles N. W. of Port Lavaca, 100 miles E. S. E. of San Antonio (for location, see map of Texas, ref. 6–I). It is in an agricultural (sugar-cane and cotton-growing) region, and contains a high school, Nazareth Academy, St. Joseph's College and Diocesan Seminary (Roman Catholic), a national bank with capital of $150,000, a private bank, and a daily, a semi-weekly, a monthly, and three weekly periodicals. Pop. (1890) 3,046; (1900) 4,010.

Victoria (or as baptized, *Alexandrina Victoria*): Queen of Great Britain and Ireland and Empress of India; b. at Kensington Palace, London, May 24, 1819; only child of Edward, Duke of Kent, fourth son of George III., and of his wife, Victoria Mary Louisa, daughter of the Duke of Saxe-Coburg-Saalfeld, and sister of Leopold, King of the Belgians. Her father having died Jan. 23, 1820, she was educated under the care of her mother and of the Duchess of Northumberland; became heiress-presumptive to the crown on the accession of William IV. in 1830, and on his death without issue (June 20, 1837) assumed the throne of Great Britain and Ireland, that of Hanover falling by the law excluding females to her uncle, the Duke of Cumberland. She was crowned in Westminster Abbey June 28, 1838; was directed in politics by Lord Melbourne, the head of a Whig administration, a statesman to whom she was personally and politically much attached; was married at St. James's Palace to her cousin Prince Albert of Saxe-Coburg-Gotha, Feb. 10, 1840. She enjoyed a reign of peace and prosperity unexampled in the annals of England under the successive administrations of Lord Melbourne (1835–41), Sir Robert Peel (1841–46), Lord John Russell (1846–52, and as Earl Russell 1865–66), Earl Derby (1852, 1858–59, and 1866–68), Earl Aberdeen (1852–55), Lord Palmerston (1855–58 and 1859–65), Benjamin Disraeli (1868, and as Earl of Beaconsfield 1874–80), W. E. Gladstone (1868–74, 1880–85, 1886, and 1892–93), Marquis of Salisbury (1885–86, 1886–92, and 1895–), Earl of Rosebery (1893–95). Among the events of her reign were the repeal of the corn-laws (1845), the Irish famine and emigration to the U. S. (1847), the Chartist agitation (1848), the Crimean war (1853–55), the Indian mutiny (1857–58), the assumption of the direct government of India (1859), the "cotton famine" and the delicate relations with the American belligerents (1861–65), the Mexican intervention and its rupture (1861–62), the Reform Bill of 1866, the confederation of British North America, the disestablishment of the Irish Church, the abolition of religious tests at the universities and of the system of purchase in the army, the Alabama Claims Treaty (1871), the introduction of the ballot, the wars in Abyssinia, Egypt, Sudan, and South Africa, the assumption of the title of Empress of India (1876), the creation and organization of the Australasian colonies, the remarkable development of public education as shown in laws of 1870 and 1872, and the prolonged agitation of the subject of home rule in Ireland. In 1876 the agitation upon the massacres in Bulgaria presaged important action upon the "Eastern question." The loss of her mother (Mar. 10) and of her husband, Prince Albert (Dec. 14, 1861), within a few months, affected her with such profound grief that although performing all the duties of sovereignty, she did not appear in public, as before, for nearly fifteen years, having spent much of the intervening time at her favorite residence, Balmoral Castle, in the Highlands of Scotland. She bore nine children. Queen Victoria was beloved for her admirable personal qualities, and beyond any other monarch gave evidence that she regarded her royal authority as held in trust for the people. She was also a pattern of every domestic virtue. The progress made by the nation during her reign was due in no small measure to her wisdom, tact, and devotion. She also gave evidence of literary culture by the publication of *Leaves from the Journal of Our Life in the Highlands* (1868), *More Leaves from the Journal, etc.* (1884), and by supervising two biographical sketches of Prince Albert, *The Early Days of His Royal Highness, the Prince-Consort* (1867), by Gen. C. Grey, and the *Life of the Prince-Consort* (1874), by Theodore Martin. The completion of the sixtieth year of her prosperous and beneficent reign was most enthusiastically celebrated throughout her wide dominions June 22, 1897. The pageant in London is said to have been the most magnificent the world has ever seen. Every part of the vast British empire was represented by troops and civil dignitaries, and princes and special ambassadors from every country of Christendom united. D. at Osborne House, Isle of Wight, Jan. 22, 1901, and was buried beside Prince Albert, at Windsor Castle, Feb. 2.

AUTHORITIES.—M'Carthy, *History of Our Own Times* (1879–97); Ward, *Reign of Victoria* (1887); also *Lives* of the Queen by Mrs. Greenwood (1883); G. Barnett Smith (1886); Dr. Macaulay (1887); J. C. Jeaffreson (1893). C. K. ADAMS.

Victoria, GUADALUPE: general, and first president of Mexico; b. in Durango, 1789. His real name was Manuel Felix Fernandez, but he changed it during the war for independence in honor of the patron saint of Mexico and of a victory over the Spaniards. He was one of the first to join the patriots in 1810, rose to be general, and, after the defeats of 1816–19, was a fugitive in the mountains of Vera Cruz during thirty months, enduring the greatest hardships, but refusing to ask for royal clemency. Subsequently he was prominent in the events which led to independence, but, as a republican, he refused to acknowledge Iturbide as emperor; was one of the chiefs of the army which overthrew him in 1823, and a member of the provisional government then formed. In politics he adhered to the federalists, and that party preponderating, he was elected president for the term of four years beginning Apr. 1, 1825, entering

upon his duties by special act Oct. 10, 1824. As an executive, he was upright and able, and for several years the country was very prosperous. In 1828–29 it was disturbed by revolts, the results of a contested election, and these were the prelude to a long series of civil wars. At the end of his term Victoria retired to private life in comparative poverty. D. at Perote, Mar. 21, 1843. HERBERT H. SMITH.

Victoria Cross: a British decoration instituted at the close of the Crimean campaign in 1856, and given only to those who have performed in the enemy's presence some signal act of bravery or patriotic devotion. It may be granted to a soldier or sailor of any rank, or to a volunteer in service against an enemy. It is in the form of a Maltese cross, and is made of bronze, having the royal crown in the center, surmounted by the lion, and on a scroll below the words, "For valour." The ribbon worn is blue for the navy and red for the army. On the clasp are two branches of laurel, from which hangs the cross. A pension of £10 a year accompanies the decoration. C. H. THURBER.

Victoria Falls: falls formed by the Zambesi in the middle of its course; in lat. 17° 55′ S. and lon. 26° 32′ E. At that point the river—a powerful but somewhat sluggish stream nearly a mile wide—rushes down into a chasm 400 feet deep surrounded with perpendicular walls of basalt. The native name is *Mossi-oa-tunia*, or Roaring Smoke. See ZAMBESI.

Victoria Land: an extensive unexplored region in the Antarctic Ocean, discovered in 1842 by Ross, who sailed along its eastern coast as far S. as lat. 78° 9′ 30″, where the twin volcanoes of Erebus (12,000 feet) and Terror (11,000 feet) send forth their smoke and fire. Other peaks are Sabrina, 11,000 feet, and Melbourne, over 13,000 feet in height.

Victoria Nyan′za: the largest lake in Africa, the second fresh-water lake in size in the world, and the principal source of the Nile; known to the inhabitants on its shores as *Ukerewe Nyanza* (Ukerewe Lake), from the name of its largest island. The equator passes through its northern portion; area about 27,000 sq. miles; altitude above the sea (Ravenstein, 1889), 3,880 feet. Considerable evidence, perhaps best summarized by Dr. Conrad Ganzenmüller (*Zeitschrift fur wissenschaftliche Geographie*), shows that the lake is identical with the eastern Nile sources of Ptolemy, with the "Crocodile Lake" of an unknown Greek writer, and with the "Kura Kavar" of the Arabs, and that fairly accurate knowledge of the territory of the Nile sources was formerly possessed, but subsequently was lost. The lake was discovered in 1858 by Capt. Speke, and in his second journey (1862) he practically solved the question as to the sources of the Nile, identifying the outflow of Victoria Nyanza as the upper course of the river. Speke saw the lake only at one point on its southern coast and along its northwestern and north central shores, and his map showing its approximate shape and extent is a remarkable production, considering that it was based almost wholly upon native information. Henry M. Stanley's map, the result of his boat survey (1875), is still the basis of mapping, though it has been changed in important respects. It has been found, for instance, that his map extended the lake too far to the N. E., covering with water a large part of the country of Kavirondo. He also missed the southwestern prolongation of the lake, first mapped (1891) by Father Schynse. Every fresh exploration shows that the present surveys are by no means adequate. Dr. Baumann discovered on the southwest coast a gulf which required five days to walk around. It first appeared on the maps in 1894 as Baumann Gulf.

The lake is imbedded, for the most part, in gneissic formations and schists. Porphyritic granite is particularly prominent on the south coast, and also forms a remarkable island—the Makoko, or White Rocks. On the north shore there are great outcrops of honeycombed ironstone and lava blocks, and the rich tropical vegetation there is in marked contrast with the sterile, arid wastes characteristic of most of the south coast. Along much of the west coast cliffs come down sheer to the water's edge, with deep water close to the shore. On the northwest and east shores there are long stretches of comparatively low land, and water so shallow that only light-draught vessels can approach within some miles of the shore.

The lake is very deep in places. The water is fresh and pure, though insipid to the taste. Fish are plentiful, and are caught mostly with hook and line, though natives in the N. E. use grass mats as a sort of net, and the islanders of the great Sesse Archipelago use basket-traps. The lake is infested with alligators, making it dangerous for any one to enter the water. Hippopotami are not plentiful except along the coast and rivers, but those found in the open water are extremely vicious, and are much feared by canoemen. It is doubtless due to the presence of these dangerous animals that most of the natives, even the islanders, are unable to swim. Another large animal is the silurus, which has been mistaken for the porpoise, owing to its shiny black body and its habit of playing at the surface in calm weather. Violent storms sweep across the lake at times, raising tremendous seas, which often engulf small craft that are caught away from the land. A curious feature, also observable in Lakes Tanganyika and Nyassa, is the periodical rise and fall of the waters, which, according to the natives, takes place about once in twenty-five years. These changes in level are distinctly shown by water-marks on the stones. Mr. E. Gedge reported (1891) that the lake was then between 8 and 9 feet below high-water mark. "The people told me that certain lands, then under cultivation, would again be flooded in due season, and that the peninsula on which my camp was pitched would again become an island."

Another peculiarity of the lake is the very limited area included in its drainage-basin. The entire north coast to the Nzoia, in the northwest, receives no river worthy of the name, the drainage, except along a narrow coast margin, flowing N. and joining the Nile. The main visible sources for the water-supply of the great reservoir are the Kagera, Nzoia, and Ngure Darash rivers. The Kagera is by far the most important feeder, and recent research indicates that its volume is only about a third less than that of the outlet —the deep, broad Somerset Nile—which flows away toward Egypt, a giant at its birth. The Kagera, with considerable improvement, it is thought, may be made a valuable commercial highway to within five days' march of Lake Tanganyika; but it seems probable that all the other streams, together with the rain that falls into the lake, supply hardly sufficient water to counterbalance the evaporation. It is suggested (Gedge, Lugard, and others) that, as the visible, inflowing streams seem totally inadequate to keep up the supply of water in the lake, there are probably large springs at its bottom that make up the deficiency.

The lake and all its shores are in the hands of Great Britain and Germany, the boundary between their possessions crossing the Nyanza on the parallel of 1° S. lat. A few sailing vessels of European construction are used, but the waters are navigated chiefly by fleets of native canoes, many of which hold forty or fifty men. C. C. ADAMS.

Victoria Regia: See WATER-LILY FAMILY.

Victorium: See the Appendix.

Victo′rius (*Vettori*), PETRUS: classical scholar; b. at Florence, Italy, July 11, 1499; studied in Pisa and Rome. After a somewhat checkered career as a soldier, diplomat, and tutor in a ducal family, he returned to his native city as a teacher of Greek and Latin. D. Dec. 18, 1584. Victorius was the greatest philologist and critic of the Italian Renaissance. His text editions and commentaries on Cicero and some of the works of Aristotle, of which he made elegant translations, are epoch-making. Other editions by him are those of Æschylus, Sophocles (the *Electra* being the *editio princeps*), Xenophon's *Memorabilia*, Terence, Sallust, Varro's *De re rustica*, Demetrius's *De elocutione*, Dionysius, Isæus, Dinarchus, Hipparchus, commentary to Eudoxus and Aratus, and Clemens Alexandrinus. But the greatest testimony to his critical genius and to the encyclopedic reach of his reading is furnished by his *Variæ Lectiones*, 38 books (Florence, 1582; Strassburg, 1609). See Bandini, *Petri Victorii vita* (Florence, 1758); H. Kämmel, *Jahn's Jahrbücher*, xcv. (1865), pp. 545 ff., xcvi. (1866), pp. 133 ff., 325 ff., 421 ff.; Fr. Creuzer, *Opuscula*, ii., pp. 21–36. ALFRED GUDEMAN.

Victor Viten′sis: Latin historian of the end of the fifth century. He wrote an account of the persecution of the Church in Africa by the Arian Vandals in three books. The best edition is by M. Petschenig (Vienna, 1881). M. W.

Vicuña, or **Vicugna**, vee-kŏon′yăă: the *Auchenia vicugna* (family *Camelidæ*), an extremely wild and active animal of the Andes, somewhat smaller than the alpaca. It is of a uniform brown color, and great numbers are annually killed for the sake of the hair, which is even more valuable than that of the alpaca. F. A. L.

Vicuña Mackenna, BENJAMIN: Chilian historian and politician; b. at Santiago, Chili, Aug. 25, 1831. Descended

from a rich and influential family, he studied at the National Institute and the University of Chili, and early became known as a writer on national history. He took an active part in the liberal revolt of 1851–52; was at one time imprisoned and condemned to death, and finally fled from the country, traveling extensively in North America and Europe. He was allowed to return in 1856, and shortly after was admitted to the bar, but was exiled for political reasons during 1859–63. Subsequently he was elected deputy, and in 1865–66 was special envoy to Peru and the U. S., editing a Spanish paper for a short time in New York. In 1870–71 he traveled in Europe, and made an important collection of documents relating to Chili. He was senator 1871–76, and *intendente* of Santiago 1872–74; in the latter capacity he did much to beautify the city, and the greatly admired pleasure-grounds of Santa Lucia are due to his private munificence. In 1875 he was the liberal candidate for the presidency, but was defeated. Mackenna is best known as the author of numerous works on the history of Chili; while exhibiting less profundity of research than those of Barros Arana, they are generally accurate, and always readable, and they have had a wide circulation. Among the most important are *El Ostracismo de los Carreras* (1857); *El Ostracismo del General O'Higgins* (1860); *Historia de la administracion Montt* (1862); *Historia de Chile* (1868); and *Campañas de Arica y Tacna* (1881). He also published various books of travel, works on Chilian mines, etc., edited or collaborated in several prominent journals, and contributed an article on Chili to the *Encyclopædia Britannica*. D. near Santiago, Jan. 25, 1886. HERBERT H. SMITH.

Vida, vee'dăă, MARCO GIROLAMO: Latin poet of the Renaissance; b. at Cremona about 1480; studied philosophy, political science, and theology at Padua and Bologna; became canon of St. John Lateran in Rome, and was apostolic secretary under Clement VII., who in 1532 made him bishop of Alba, where he died Sept. 27, 1566. His smooth versification and lucidity of style, though worthy of admiration, scarcely atone for the lack of originality in thought and diction which characterizes all his poetry. Cicero, Quintilian, and above all, Vergil, are the fountains of his inspiration. He wrote a theological epic, *Christias*, in six books; *Bombyx*, a didactic poem on silkworms, in the manner of Vergil's *Georgics*; and a versified description of the game of chess, entitled *Scacchiæ Ludus*. The work upon which his fame is chiefly dependent is *De arte poetica*, in three books, containing 1,698 hexameters, eulogized by Pope in his *Essay on Criticism* (vss. 697–708), and pronounced by Warton to be perhaps the very first piece of literary criticism of the Renaissance. For an analysis of the poem, easily accessible in Cook's *The Art of Poetry* (with Pitt's translation, Boston, 1892), see A. Baldi, *Die Ars Poetica des M. Hieronymus Vida* (Würzburg, 1881); and in general, Lancetti, *Della vita et degli scritti di Vida* (Milan, 1840); Roscoe, *Life of Leo X.*, vol. ii.; J. A. Symonds, *Renaissance in Italy*, vol. ii. A complete collection of Vida's writings was published in London (2 vols., 1732). A. GUDEMAN.

Vidal, vee-daal', PEIRE: Provençal troubadour; flourished about 1175 to 1215. He was a native of Toulouse, the son of a furrier. He was one of the most prolific of the troubadours, though he seems all his life to have been on the verge of insanity. The famous Blacatz, patron of the troubadours, expressed wonder in one of his own poems that Vidal should have sense and talents in poetry, but madness in everything else. The contemporary accounts of his life are so full of fantastic episodes that we should incline to regard them as pure inventions were not many of the details confirmed by the poet himself. He led an extremely vagrant life, appearing at the courts of Alfonso II. of Aragon, Barral, Viscount of Marseilles, Raymond VI., Count of Toulouse, Boniface II., Marquis of Montferrat, Emmerich, King of Hungary, and perhaps Richard I., Count of Poitiers (later King of England). The most indulgent of these patrons seems to have been Barral of Marseilles, though finally the poet was obliged to leave his court, owing to the over ardor of his devotion to the Countess Adalasia, into whose apartment he penetrated early one morning and awoke her with a kiss. The number of his love adventures was very great, and in many of them he conducted himself most fantastically. The climax of his folly was reached, however, during the crusade of King Richard (1190), which he had joined. Arriving in Cyprus, the poet did not continue to the Holy Land, but married a Greek lady, and turned back to Europe. In some way he became persuaded that his wife was the daughter of the Greek emperor at Constantinople, and that he had therefore rights to the Greek throne. He determined to assert these, and, assuming the imperial arms, he made those about him call him emperor, sat upon a throne, and fitted out a fleet in order to win his kingdom. The end of his career is veiled in obscurity. Despite his vagaries, Peire Vidal was one of the most original of the Provençal poets of his time, and many of his verses are remarkable for vigor of feeling and beauty of diction. See *Die Lieder Peire Vidals*, ed. by Karl Bartsch (Berlin, 1857); Sigmund Schopf, *Beiträge zur Biographie und zur Chronologie der Lieder des Troubadours Peire Vidal* (Breslau, 1887). A. R. MARSH.

Vidar: in Norse mythology, the god of silence, son of Odin and the giantess Grid.

Vidaurri, vee-dow'ree, SANTIAGO: b. in the present state of Nuevo Leon, Mexico, about 1803; received a good education; became a lawyer; filled many minor offices; took part in several civil wars, in which he rose to the rank of general; became about 1853 governor of Nuevo Leon, to which he forcibly annexed (1856) the state of Coahuila; exercised for some years a species of dictatorship over the northern states of Mexico, where he was more than once suspected of intending to found the independent "republic of Sierra Madre"; aided in the campaign for the overthrow of Santa Anna 1854–55, though without political combination with Alvarez and Comonfort, his "plan" being distinct from that of Ayutla; was a candidate for the presidency at the junta of Cuernavaca Oct., 1855. He did not recognize the government of Comonfort until Nov., 1856; held the northern states against Zuloaga and Miramon during the "war of reform" 1857–60, and took part in the war against French intervention 1862–64, but was induced to recognize the empire of Maximilian, of whom he ultimately became a cabinet minister; was captured at the fall of the city of Mexico, and shot there as a traitor Aug. 8, 1867.

Vidocq, vee'dōk', EUGÈNE FRANÇOIS: detective; b. at Arras, department of Pas de Calais, France, July 23, 1775; while a boy robbed his father's shop and ran away from home. He soon spent his money, and after a period of vagabondage and misery entered the army, but deserted to the Austrians; left them too, and served again in the French army. After many adventures of a discreditable sort he was sentenced to eight years' imprisonment; escaped before his time was up, and was employed in 1809 by the secret police of Paris; was made chief of the *brigade de sureté*, consisting of convicts and other notorious characters as spies, and fully pardoned in 1818; left the service of the police in 1827, and settled at St. Mandé, near Paris, as a paper manufacturer; failed in business, and opened a *bureau de renseignement* in Paris for the recovery of stolen goods, but came into conflict with the police, and was compelled to close his office; lived afterward in obscurity and poverty, and died in Paris, Apr. 28, 1857. His *Mémoires* (4 vols., 1828; translated into English in the same year) are not without interest, but their contents are considered unreliable, and even their authorship is doubted. His name is associated with many fictitious adventures, and occurs continually in detective literature. Revised by F. M. COLBY.

Vieira, vee-ā'ee-raă, ANTONIO: author, orator, and statesman; b. in Lisbon, Portugal, Feb. 6, 1608. In 1615 his family moved to Bahia, Brazil, where he attended the Jesuit schools, entered the order in 1627, and at the age of nineteen taught rhetoric and philosophy. He was ordained presbyter in 1635, and preached at Bahia and in the neighboring villages. His eloquence attracted the attention of the governor, Mascarenhas, who, on his return to Europe in 1641, took him to Lisbon. There Vieira quickly attracted crowds to his sermons, and took rank among the foremost pulpit orators of the world. He was nominated royal preacher in 1644, entered the royal council in 1646, and was for a time practically prime minister, exercising great influence over the affairs of Europe. In 1647–49 he was ambassador to Paris and The Hague, also visiting London. In 1650 he was sent to Rome on an important secret mission connected with the relations of Portugal and Spain. For reasons now unknown, he fell into disgrace with his order, was threatened with expulsion, and in 1652 was thrown into comparative obscurity by being made director of the missions in Northern Brazil. There he showed great zeal in protecting the Indians, and made a voyage to Portugal to secure royal aid for them (1654), but in 1661 was seized by the colonists, and sent a prisoner to Lisbon. He was quickly released, but lost his

VIE
Scale of Kilometers
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Laxenburger Str.
Favoriten
Alleegasse
Johannes-Str.
Schwarzenberg Str.
Heu
Augarten Br.
Augarten Str.
Jägerstr.
Brigitten Br.
Franz Josefs Bahn
Donaukanal
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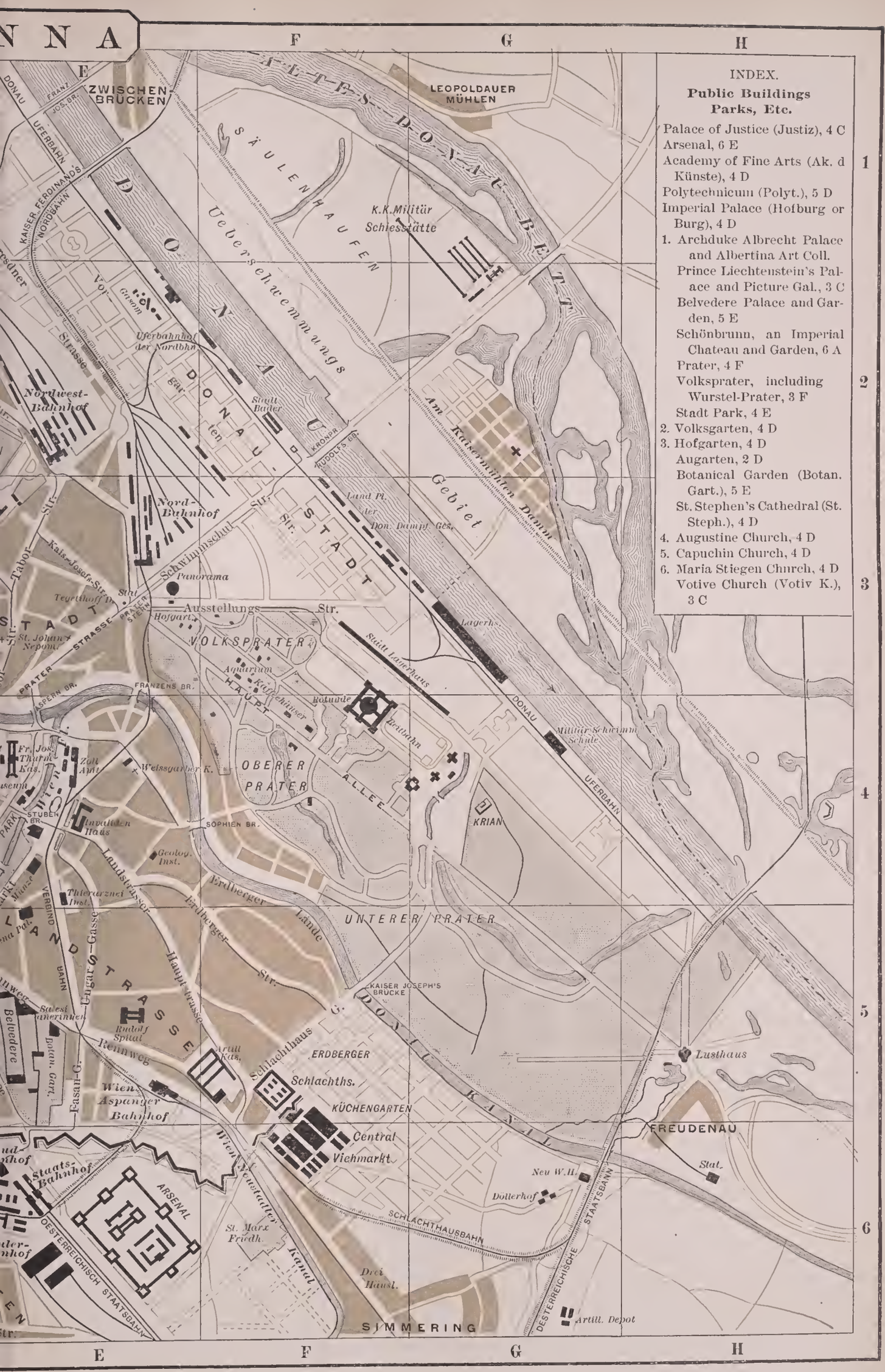
Prater
Rau


NNA
F
G
H
E
ZWISCHEN-BRÜCKEN
LEOPOLDAUER MÜHLEN
SÄULENHAUFEN
K.K. Militär Schiesstätte
Ueberschwemmungs
DONAU
Uferbahnhof der Nordbhn
Nordwest-Bahnhof
Stadt Bader
Am Kaisermühlen Damm
Gebiet
Nord-Bahnhof
Schwimmschul
Panorama
Ausstellungs Str.
Hofgart.
VOLKSPRATER
Aquarium
Rotunde
Reitbahn
Lagerhs.
Stadt Lagerhaus
Militär Schwimm Schule
DONAU UFERBAHN
FRANZENS BR.
OBERER PRATER
ALLEE
KRIAN
Weissgarber K.
SOPHIEN BR.
Invaliden Haus
Geolog. Inst.
Thierarznei Inst.
Erdberger Lände
UNTERER PRATER
KAISER JOSEPH'S BRÜCKE
DONAU KANAL
Lusthaus
FREUDENAU
Stat.
Neu W.H.
Döllerhof
SCHLACHTHAUSBAHN
DESTERREICHISCHE STAATSBAHN
Artill. Depot
SIMMERING
Drei Häusl.
St. Marx Friedh.
Wien Neustadter Kanal
Wien Aspanger Bahnhof
Rudolf Spital
Rennweg
Artill Kas.
Schlachthaus
ERDBERGER
Schlachths.
KÜCHENGARTEN
Central Viehmarkt
Staats-Bahnhof
ARSENAL
Belvedere
Botan. Gart.
Fasan-G.
Ungar-Gasse
Landstrasse
Hauptstrasse
Erdberger Str.
Landstrasse
Tabor Str.
Kais.-Josefs-Str.
Tegetthoff D.
St. Johan Nepom.
PRATER STRASSE
Stat.
Gasom
Vor Strasse
KAISER FERDINANDS NORDBAHN
DONAU UFERBAHN
FRANZ JOS. BR.
KRONPR. RUDOLFS BB.
Land Pl. der Don. Dampf. Ges.
Zoll Amt
Fr. Jos. Thurm Kas.
STUBEN BR.
VERBIND BAHN
Salesianerinnen
Rudolf Spital
Artill. Depot
DESTERREICHISCH STAATSBAHN
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influence at court. In 1665 one of his writings was condemned by the Inquisition, and he was imprisoned for two years. In 1670–75 he was in Rome, where he preached with great satisfaction in Italian and Latin. In 1681 he returned to Brazil, where he became provincial of his order (1688). D. at Bahia, July 18, 1697. Vieira's principal published works are his *Sermons* (1679–99), which are regarded by many as the greatest prose masterpieces of the Portuguese language. A good selection in six volumes was published in Lisbon in 1852–53. His *Letters*, scattered through various lications, are often of great historical importance. H. H. S.

Vielé, vee'lā, Egbert Ludovickus: soldier; b. at Waterford, N. Y., June 17, 1825; graduated at the U. S. Military Academy July 1, 1847, when commissioned brevet second lieutenant of infantry, and ordered to the seat of war in Mexico, serving at the capital 1847–48; in campaign against Indians 1848–52. He resigned June 1, 1853, to enter upon the profession of civil engineering; was State engineer of New Jersey 1854–56; chief engineer of Central Park, New York, 1856–57, preparing the original plan, which was adopted. He also designed Prospect Park in Brooklyn, N. Y. On the outbreak of the civil war he entered the Union army, and in Aug., 1861, was appointed brigadier-general U. S. volunteers; was second in command of the land forces in the capture of Port Royal, chief in command in the investment of Fort Pulaski, Ga., planned and led the march on and capture of Norfolk, Va., and was military governor of that city 1862–63; resigned Oct., 1863, and resumed his profession of engineering at New York; became park commissioner in 1883; M. C. 1885–87; since then has devoted his leisure to professional and literary pursuits. Author of *Handbook of Active Service* (New York, 1861); *A Topographical Atlas of the City of New York* (1865); and various professional papers and reports.

Vien, vee'aăṅ', Joseph Marie: painter and teacher of painting; b. at Montpellier, France, June 18, 1716. In 1743 he won the great prize of Rome at the School of Fine Arts in Paris, and on reaching Rome he was strongly drawn toward the study of the masters who stood for antiquity and classical art, among whom he himself names Raphael, Caracci, Domenichino, and Michaelangelo. His feeling was that he must avoid the art, then so popular, of Boucher, Pigalle, Fragonard, and Greuze, and he turned to that which was stately and dignified, both in subject and in treatment. He did not reach great excellence as an artist; his paintings are inferior to those of the men whom he preached against; but he was made director of the French school of art in Rome in 1775, and at once began the effort of his life. Among other improvements, he required his students to draw and to paint from the living model for a day at least three times a week. He also taught the closest adhesion to the classical style as he had built it up for his pupils from his study of the earlier Italian masters. His chief pupil was Jacques Louis David, who joined in the general approval of his old master, even when he became the head of a school, so that it was as the master of David that Vien became especially famous. He returned to Paris, and was ennobled by Louis XVI., and after the Revolution was employed and honored by Napoleon. D. in Paris, Mar. 27, 1809. His best-known pictures are *St. Germain l'Auxerrois and St. Vincent* and *The Sleeping Hermit*, both in the Louvre. There are also pictures in the gallery of Montpellier and in other museums in France. Russell Sturgis.

Vien'na (Germ. *Wien*, a word of Celtic origin): the imperial capital of Austria-Hungary; on the right bank of the Danube, in lat. (new observatory) 48° 13′ 55″ and lon. 16° 20′ 18″ E.; 340 miles S. S. E. of Berlin (see map of Austria-Hungary, ref. 5–E). Here occurs the only break in the great chain of the Alps and Carpathian Mountains, which divide the northwestern from the southeastern part of Central Europe. Hence it was chosen by the Romans, about the beginning of our era, as a place especially worthy of settlement and fortification against the tribes N. of the Danube. During the Middle Ages it became a great center of trade between North and South, East and West, and thus acquired a cosmopolitan character which renders it to-day one of the most interesting and beautiful cities of Europe. It is traversed by a navigable canal, called the Little Danube to distinguish it from the Great or main Danube, whence its waters are drawn. The *Wien* is an insignificant streamlet flowing through the city, and would long ago have been degraded to the condition of a sewer if it were not for the great freshets to which it is periodically subject. The city lies at the base of the double-peaked *Kahlenberg* (Bald Mountain), on which is seen the border of the famous *Wiener Wald* (Viennese Woods), whose beauty renders the environs of the city among the most attractive in the world.

Climate.—The extremes of temperature for 1890 were zero and 92° F.; the mean, 48°; the prevailing winds are west; the average moisture for eleven years, 75 per cent.; the average rainfall for forty years, 24 inches; with rain on 149 days in the year (mean of thirty years).

Streets, Parks, etc.—There are 2,214 streets, alleys, and squares. The Ringstrasse is the finest boulevard; it occupies the site of the old walls, averages about 150 feet in width, has shady promenades and a bridle-path, as well as broad sidewalks and ample room for cars and carriages. On or near it are situated most of the finest buildings of the city, and several of the parks and handsome squares border upon it. The largest of the ten parks in Vienna is the Prater, in one part of which is the fashionable drive; another portion is known as the Wurstel-Prater, or Punch and Judy Park, where a great variety of cheap shows is offered to the masses. The World's Fair of 1873 was held in the Prater, and the rotunda of the main building still remains. Near by is the race-course, where all classes of the population are largely represented at the semi-annual meets. The city streets are mostly paved with granite blocks, and are kept remarkably clean at an annual cost (1890) of 884,205 gulden; the summer sprinkling costs 183,994 gulden. Under the streets are 290 miles of gas-pipe and (old part) 485 miles of sewers. There are more than 800 electric arc-lamps and 36,000 incandescent lights.

Means of Transit; Water-supply.—The street-railways have a combined length of 62 miles, and carried in 1890 nearly 53,000,000 passengers. There are 63 omnibus routes, provided with 619 omnibuses, 954 fiacres, or two-horse public carriages, 1,221 one-horse hacks, and 1,217 other public conveyances. On the various street corners are to be found 1,600 street porters, who go on errands and carry packages at fixed, moderate prices. Vienna is supplied with pure mountain spring-water, brought to the city in an aqueduct 60 miles long, which was built in 1870–74 at a cost of 24,000,000 gulden; the reservoirs hold 45,000,000 gal., the average daily supply (1890) was 18,000,000 gal., and the water is conveyed to 12,329 houses through 207 miles of pipe, varying from 2⅛ to 37½ inches in diameter. There are 7 river baths, one of which is free, and 25 city baths, two of which are magnificent establishments, luxuriously fitted up.

Public Buildings, Monuments, and Palaces.—The public and private buildings of Vienna include some of the finest products of modern architecture. The Parliament building, designed by Theophil Hansen, is an immense white marble structure in Greek style, elaborately ornamented with colossal statues and reliefs. The Rathhaus (municipal hall), of yellow sandstone, is a magnificent adaptation of Gothic motives to secular needs, by Friedrich Schmidt. The court theater is of white marble, in Renaissance style, and its sculptures, in numerous portraits and allegorical figures, tell the story of the world's drama. The *Triumph of Bacchus*, which ornaments the blocking-course of the main façade, is one of the grandest of all modern reliefs. The University building, with its nine courts, is a beautiful example of Renaissance design by Heinrich Ferstel, although unfortunately carried out only in brick and stucco; it has great marble stairways, fine halls of ceremony, and an extensive library and large reading-room. These structures are on the four sides of the Rathhaus Square, with its shady walks and wealth of flowering trees. The two imperial museum buildings, of great extent and elaborate ornamentation, face each other across a square, in the center of which stands the great monument to Maria Theresa, surrounded by flower-beds and shrubbery, amid which play the waters of four exquisite marble fountains. Other noteworthy monuments are those to Schiller, Beethoven, Haydn, Schubert, Archduke Charles, Prince Eugene of Savoy, Prince Schwarzenberg, the Emperors Joseph and Francis, and the later ones to Tegetthoff, Liebenberg, Grillparzer, and Radetzky; also the Trinity column. The third side of this square is occupied by the imperial stables, in which are housed several hundred fine horses and an immense collection of carriages, saddles, etc. The fourth side is to be occupied by the imperial palace, now (1895) in process of building, whose estimated cost is said to be 40,000,000 gulden. Behind this is the Burg, a great cluster of buildings which have been erected from time to time since Duke Leopold the Glorious built his castle here about 1220, a portion of which still exists in the tract known as

the Schweizerhof. In the Burg are the imperial residence and the great halls of ceremony; the Schatzkammer or superb collection of crown jewels, together with many beautiful objects of semi-precious stones; the winter riding-school, an imposing wing of the palace, designed by Fischer von Erlach; the court library, the ceiling of whose great hall is adorned with the chief work of the painter Daniel Gran. There are many other palaces in the city, among which are the Belvedere, with its extensive garden, built by Prince Eugene of Savoy, 1724; that of Archduke Albrecht (d. 1895), famous for its art collection, known as the Albertina; Prince Liechtenstein's, with its choice picture-gallery; and those of Counts Harrach and Esterhazy, also containing noteworthy art collections. Other noteworthy buildings are the court opera-house, the Academy of Fine Arts, the Austrian Industrial Museum, the Bourse and Commercial Museum, the Arsenal, and the Palace of Justice.

Churches.—Of the churches the grandest is St. Stephen's Cathedral, whose corner-stone was laid in the twelfth century, but which was altered and greatly enlarged from the fourteenth to the sixteenth centuries. Its graceful tower rises 453 feet above the street, and is crowned with a gilded double-headed eagle, surmounted by a cross. The most beautiful ecclesiastical structure is the Votive church, ornamental Gothic in style and of exquisite proportions, designed by Ferstel, and erected in commemoration of the escape of the Emperor Francis Joseph from death by assassination in 1853. The vaults of the Capuchin church are interesting as the last resting-place of many of the Hapsburgs, whose remains are inclosed in bronze caskets, some of which are extremely elaborate. In the Augustine church is the celebrated monument to the Archduchess Christina, which is one of the most beautiful works of Canova. Churches are not numerous in Vienna (63), and as a rule contain but little to interest the traveler. There are 16 monasteries, the oldest of which dates from 1158; in 1890 they were occupied by 520 brethren of various orders. There were also 20 nunneries, with 1,563 inmates.

Education.—Schools are provided by public, private, and corporate means, and give instruction in every department, from hair-dressing to theology. In 1855 a concordat was entered into with the pope, placing education entirely under the supervision of the Church; but in 1868 the public demand for its abolition became irresistible, and in the following year a new school law was passed providing for the entire secularization of the public schools, but furnishing at suitable times religious instruction in both Roman Catholic and Protestant faiths, according to the desires of parents. At the close of 1890 the city possessed 300 primary schools, attended by 75,000 boys and 76,000 girls, with 1,993 male and 1,025 female teachers; of these, 403 were for religious instruction. There were 24 technical schools for teaching bookbinding, printing, glove-making, gardening, glass-blowing, the making of fans, optical instruments, etc., and these were provided with 82 instructors and attended by 6,274 pupils; 29 middle and high schools (*gymnasia*) had 677 instructors and 9,642 pupils; the city Commercial College had 36 instructors and 890 pupils, besides which there were other commercial schools, with 124 teachers and 2,991 scholars. The Agricultural College had 46 instructors and 224 students; the Academy of Fine Arts, 25 instructors and 274 students; the Polytechnicum, 97 instructors and 836 students; and the Protestant Theological Seminary (the Roman Catholic forms one faculty of the university), 7 instructors and 38 students. The Theresianum is a school founded by Maria Theresa to prepare noblemen's sons for public service. Since the revolution of 1848 it has received also students not of noble birth. One department of it is known as the Oriental Academy, where students are prepared for diplomatic and consular service in the Orient, and before graduating must have a good knowledge of law in its various branches, of political science, and at least a reading knowledge of ten modern languages. The university offers instruction by 385 teachers, and in the winter of 1890–91 was attended by 6,220 students—the largest attendance at any institution where German is spoken. It was founded in 1365, has passed through many vicissitudes, was under Jesuit domination for a century, and has been greatly improved since 1870. Its medical faculty has enjoyed worldwide fame for a hundred years.

Libraries, Museums, and Art Galleries.—The city is well supplied with libraries, the largest of which is the imperial, which contains 400,000 volumes and 20,000 MSS. There is also an imperial private library, which contains 80,000 volumes, including 800 incunabula; also 26,000 maps and plans, 50,000 copper plates and drawings, and over 180,000 portraits. The Albertina contains 40,000 volumes, largely if not exclusively pertaining to matters of art, 23,000 maps and plans, 90,000 engravings exclusive of those in books, and 15,800 leaves of drawings by noted artists. There are also more or less extensive libraries in connection with the university, Theresianum, Academy of Fine Arts, Rathhaus, and the Polytechnicum, besides a music archive of 12,000 volumes, and 15 private circulating libraries. The newspaper and periodical publications number 863, of which 32 are dailies. Censorship of the press still exists, and is at times rigorously exercised. The Academy of Sciences, founded in 1847, has numbered among its members many scientists of international reputation, including Bancroft and Agassiz. Its work embraces the preparation and publication of the *Fontes rerum Austriacorum*, the *Acta conciliorum sæculi xv.*, a *Corpus* of the critically justified texts of the Latin Church Fathers, and a collection of Greek epitaphs. The imperial art collections have a magnificent home, and are said to surpass all other collections in pictures by Rubens, Dürer, and Van Dyke, and to be remarkably rich in paintings by Titian, Tintoretto, Holbein, and Clouet. In the possession of portraits of children by Velasquez, Vienna is said to rival Madrid itself. Under the same roof stands Canova's greatest work, *Theseus and the Centaur*; there is also a collection of Egyptian antiquities, of coins and medallions, the famous Ambras collection of arms, and many interesting articles illustrative of history from the Middle Ages to the present. In the companion building, the dome of which, painted by Makart, contains what is believed to be the largest pictorial canvas in the world, the natural history collections are scientifically and artistically arranged, and offer the student almost unlimited opportunities for investigation. Among other valuable collections are the Austrian Industrial Museum, the Commercial Museum, the Army Museum in the arsenal, the Anatomical and Pathological, the Technical, and the City Historical Museums. The city has established also a permanent educational exposition, containing about 18,000 objects of educational value, and has constituted a central commission for investigating and preserving monuments of art and history.

Music and Drama.—The love of music is strong in the Viennese; and here, where Gluck, Haydn, Mozart, Beethoven, Schubert, Wagner, Brahms, Strauss, Lanner, Millöcker, and Suppé have made their home, music of all kinds is enthusiastically cultivated, as is attested by the existence of 100 music schools, 60 musical societies, and a large number of concert-halls, not to mention the court opera and the great Music Hall. There are seven theaters, with audience room for 11,289 persons. During the year 1890 the court opera gave 61 different grand operas, 13 operettas, and 15 ballets; and the court theater gave 106 different pieces.

Population.—The population (census of Dec. 31, 1890) is 1,364,548, and there are 40,000 more females than males, notwithstanding the presence of more than 22,000 soldiers. The Roman Catholics number 1,195,175; Old Catholics, 1,264; Jews, 118,495; and Protestants, chiefly of two denominations, 41,943. Added to the representatives of all the various nationalities which constitute the Austrian-Hungarian empire are 18,328 persons of other nationalities. The people are good-natured and polite, spend much of their leisure in cafés and restaurants, and love amusements, especially music and dancing.

Commerce.—The commercial supremacy of Vienna received a serious blow when in 1867 Hungary was given a constitution which made it practically independent of Austria; and the more recent Bohemian contention for autonomy has caused Prague to be favored more or less at the expense of Vienna. The international seed-market of Vienna has acquired great importance; the export of shoes to Australia, of men's clothes to the Orient, of hats to all parts of Europe, and imitations of Oriental rugs to the U. S., is very extensive. In 1890 the railways shipped from the city 1,143,138 tons of freight, and brought to it 3,543,951 tons, besides 55,000 and 129,000 tons, respectively, of express matter. The private railways sent 72,839 passenger-trains out of the city with 4,598,888 passengers, and 73,742 trains into the city with 4,652,066 passengers. Owing to the new system of "zone" tickets, the state railways are not able to report the passenger traffic to and from the city. The year's product of beer was 32,429,683 gal., much of which was exported. The consumption of beer, domestic and imported, was 28,322,035 gal.; of wine, 10,086,433 gal. Tobacco is a Government

monopoly, and in the governmental retail store of Vienna there were sold in 1890 Havana and domestic cigars, cigarettes, and smoking tobacco and snuff, the proceeds of which amounted to 1,405,197 gulden. To the retailers were sold cigars, cigarettes, smoking tobacco and snuff, from all which the proceeds were 14,072,061 gulden.

Banks, etc.—The city has its official savings-banks, the deposits in which on Dec. 31, 1890, were 11,904,357 gulden, from 24,623 depositors. The First Austrian Savings-bank had deposits of 184,005,731 gulden from 401,970 depositors. Fifteen banks have a paid-up capital of 267,900,000 gulden, divided into 1,348,600 shares, which pay an average profit of 8·2 per cent. Their resources in 1890 were 1,493,884,427 gulden, with a gold and silver stock of 244,490,368 gulden; the outstanding bank-notes amounted to 445,934,210 gulden. The city conducts a pawn institute, which had outstanding loans of 174,045 gulden; the state has another, whose loans were 4,826,000 gulden; while the Allgemeine Verkehrsbank had loans amounting to 17,000,000 gulden, of which 6,500,000 were on jewels. Besides these there were thirteen private pawnshops.

Industries.—In the manufacture of silk goods, of fine instruments for surgical, mathematical, and physical work, of pianos, violins, and other musical instruments, of fancy leather goods, of amber and meerschaum goods, of embroideries, including hose in gold and silver, Vienna holds an important place. There are several organizations for securing employment for those out of work. In 1890 these reported 9,184 applications and 4,748 vacancies, of which they filled 3,409. The Government has established industrial courts of arbitration, which held in 1890 1,040 sessions and received 2,505 complaints, of which they settled more than 1,600. There are 62 insurance companies of all kinds, including one against storm and hail, one for looking-glasses, and one for steam-boilers.

Postal and Telegraph Service.—The postal service is excellent, with 92 post-offices and 1,009 letter-boxes in the city, besides 25 stations of the pneumatic post for quick delivery. During 1890 the last named handled 1,330,352 letters and cards, besides 1,821 cards with prepaid answer. The post-office guarantees registered letters, and has a system of "money letters," the value of the contents of which is written on the envelope, and their safety guaranteed by the Government. The government owns also most of the telegraph lines, and has in the city 118 offices, through which 7,400,000 messages passed in 1890.

Public Finance.—Taxes on articles of consumption are still imposed at the entrances to the city, but have been greatly simplified. The public income in 1890 was 21,000,000 gulden, the expenses being 20,883,000 gulden; the value of city property, including all public buildings, furnishings, parks, streets, bridges, sewers, etc., was estimated at 120,000,000 gulden; and the city debt was 55,000,000 gulden.

Charity.—Much is done for the poor, 6,500,000 gulden being expended on them in 1890. Sixty-eight hospitals have 6,702 beds, of which the General Hospital furnishes 3,000. During 1890 there were 68,809 indoor patients, of whom 41,385 were cured. There are 8 orphan asylums, and many other charitable institutions, and 375 charitable organizations.

Government.—The city government consists of a burgomaster, two vice-burgomasters, a city or select council, and a large common council. The burgomaster is chosen by the electors, and his appointment must be confirmed by the emperor. The police system is well organized, and is partly under state control.

History.—The Roman camp Vindobona, sometimes called Vindomina, grew in importance and strength, became a *municipium* (city), and was the scene of the death of the Emperor Marcus Aurelius in 180. Later it fell into obscurity so complete that for five centuries nothing whatever is known of it. In 1030 it was mentioned under its present name, and it was then a walled place of considerable importance. The Celts of this region were conquered by Charlemagne, and afterward German settlers came. The whole is supposed to have passed into German possession by the eleventh century. The Babenberger margraves were the rulers, and in 1096 St. Leopold built a castle for his official residence on Leopoldsberg, or that part of the Kahlenberg nearest the Danube. About 1160 Henry II. erected a castle just outside the walls of Vienna, which from 1142 has been designated as a city. In 1221 it received its first recorded *Stadtrecht*, or charter of privileges; in 1237 a *Freibrief* was given it by Frederick of Hohenstaufen, which is still preserved. In 1276 Vienna, with Austria, Styria, etc., passed into the hands of Rudolph of Hapsburg. From 1485 to 1490 the city was occupied by the powerful and learned Hungarian king, Matthew Corvinus. In 1526 a new city ordinance was issued by the Archduke Ferdinand, which is known as "the grave of the city's freedom," under which the city was practically ruled until the revolution of 1848. In 1529 and in 1683 Vienna was besieged by the Turks. The successful defense against the first siege was under the leadership of Count Nicholas Salm. The second siege was ended by the victory of a relief army consisting of 84,000 troops, 27,000 of whom were commanded by Duke Charles of Lorraine, 31,000 by different petty princes, and 26,000 by John Sobieski, King of Poland. In the winter of 1805–06, and the summer of 1809, French troops occupied the city, and Napoleon resided in the neighboring palace of Schönbrun. His fate was sealed at the congress which met here in 1814–15. During the troubled times of 1848 Vienna was for a time the hope of the European revolutionists; but it was bombarded and taken by the imperial troops Oct. 31. A new constitution was given Mar. 17, 1849, but did not become valid until 1861. On Dec. 20, 1857, the emperor signed the decree for the removal of the city walls, which has contributed much to the beauty of the city. On Dec. 19, 1890, he signed the document on which is founded the incorporation of nine new districts into the city proper, which now covers 63·7 sq. miles, and is divided into nineteen wards.

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WALTER B. SCAIFE.

Vienna, Concordat of: See CONCORDAT.

Vienna, Congress of (Sept., 1814, to June, 1815): a congress of the European powers to readjust the affairs of Europe after the Napoleonic wars. There were present the monarchs of Austria, Prussia, Russia, Denmark, Bavaria, and Würtemberg, besides a crowd of minor princes and diplomatic representatives of all European states except Turkey—Talleyrand from France, Castlereagh from England, Metternich from Austria, Nesselrode from Russia, Hardenberg from Prussia, Münster from Hanover, etc.—besides many diplomatists without any distinct official character, such as Stein, Wilhelm von Humboldt, Pozzo di Borgo, etc. During the congress Vienna was the scene of continual festivities of the most sumptuous kind, the Austrian court spending about $50,000 a day for a considerable period in the entertainment of the visitors. The business of the congress was hindered by intrigues and petty jealousies which were cleverly fostered by Talleyrand for the advantage of France, and at one time war seemed inevitable, but the news of the return of Napoleon from Elba in Mar., 1815, frightened the assembled statesmen into more harmonious action. At first the two most serious questions before the congress were those respecting Poland and Saxony. Russia claimed the former, Prussia the latter, while the other powers were divided on both questions. Talleyrand, advancing the theory of *legitimacy* as the principle that should guide the congress, sided with Austria against Prussia on the Saxon question, and raised France from the state of a discredited and neglected power to a position of controlling influence in the congress. Finally, a compromise was reached, giving the lion's share of the duchy of Warsaw to the czar, to be formed into the kingdom of Poland, and dividing Saxony almost equally between Prussia and the Saxon king. The pope was reinstated in all his possessions, with the exception of Avignon and Venaissin, which were given to France, and some small Italian districts, which were given to Austria. These cessions, however insignificant, were nevertheless too much for his holiness, who protested in a most solemn manner against the whole congress. The rest of Italy was again parceled out in domains for French and Austrian princes. Austria was re-established in its old glory as an utterly artificial agglomeration of different nationalities. Norway was taken from Denmark and added to Sweden, in order to pay Bernadotte for turning against Napoleon, and Denmark was paid with Lauenburg and other German districts. The Spanish Netherlands (Belgium) were added to the Dutch Netherlands, and the whole formed into the kingdom of Hol-

land, in spite of the radical differences in language, religion, and economical interests; but it was the only way in which England could retain the Dutch colonies which she had conquered during the Napoleonic wars. To restore the German empire was found impossible, on account of the rivalry between Prussia and Austria, but, having restored some of the petty princes, the congress manufactured a *Bund*, which remained the sole central government for Germany till 1866. See *Akten des Wiener Kongresses* (9 vols., Frankfort, 1815–35); *Uebersicht der diplomatischen Verhandlungen des Wiener Kongresses* (Frankfort, 1816); Flassan, *Histoire du Congrès de Vienne* (3 vols., Paris, 1829); Lagarde, *Fêtes et Souvenirs du Congrès de Vienne* (2 vols., Paris, 1843); and *Correspondence between Talleyrand and Louis XVIII.* (Eng. trans., 1881). Revised by F. M. Colby.

Vienna Green: See Schweinfurth Green.

Vienna Paste, or **Vienna Caustic**: a mixture of caustic potash and quicklime used in medicine as a caustic.

Vienne, vēē'en': an inland department of Western France; on both sides of the river Vienne, an affluent of the Loire; area, 2,691 sq. miles. The surface presents an elevated plain, with a general slope to the N. The soil is not very fertile, yet more wheat and wine are produced than necessary for home consumption. Hemp, flax, and chestnuts are also extensively raised, and good breeds of mules and horses are reared. Much iron is mined, and building-stone and lithographic stones are quarried. Pop. (1896) 338,114. Capital, Poitiers.

Vienne (anc. *Vienna*): an ancient town of France; department of Isère, on the Gère, near its influx in the Rhône; 19 miles by rail S. of Lyons (see map of France, ref. 6–H). It contains many interesting remains of the Roman epoch, such as a triumphal arch, an amphitheater, and a temple. Pilate is said to have been banished to this place. It was the cradle of Western Christianity. The fifteenth œcumenical council of the Roman Catholic Church met here in 1311–12. There are rich silver and iron mines in the vicinity, and an excellent wine is produced. The manufactures include woolen and linen fabrics of different descriptions, cutlery and hardware, iron, glass, and leather. The trade is brisk. Pop. (1896) 24,977. Revised by M. W. Harrington.

Vieque: See the Appendix.

Viersen, feer'sen: town and railway junction of Rhenish Prussia; 20 miles by rail N. W. of Düsseldorf (see map of German Empire, ref. 4–C). It has manufactures of woolen, cotton, linen, plush, and silk fabrics, ribbons, leather, tobacco, vinegar, soap, and straw hats. Pop. (1890) 22,198.

Vierzon, vēē'ăr'zōṅ': town; department of Cher, France; at the confluence of the Yèvre and Cher; 20 miles by rail N. W. of Bourges (see map of France, ref. 5–F). It has cannon-foundries, tanneries, and manufactures of linen, woolen, and silk fabrics, glass, and porcelain. It is divided administratively into *Vierzon-Ville*, *Vierzon-Village*, and *Vierzon-Bourgneuf*, making together an industrial group of importance with a population of (1891) 19,958. M. W. H.

Vieta, vēē-ā'tăa, or **Viète**, vēē'āt', François: mathematician; b. at Fontenay-le-Comte, department of Vendée, France, in 1540; held various offices in the civil service of the French Government during the reigns of Henry III. and Henry IV. D. in Paris, Feb., 1603. It is as a mathematician, however, that he has been known since. Most of his works were collected by Van Schooten and published at Leyden in 1646.

Vieussens, vēē'ö'săăṅ', Raymond: physician; b. in the countship of Rouergue, present department of Gironde, France, in 1641; graduated in medicine in Montpellier, where he held for many years a position in the hospital of St. Eloi, and acquired great reputation for his investigations of the brain (the *valve of Vieussens*) and the spinal cord. He wrote *Neurographia Universalis* (1685) and *Traité des Liqueurs du Corps humain* (1715). D. at Montpellier in 1720. S. T. Armstrong.

Vigevano, vēē-jā'-văă-nō (anc. *Vicus Veneris*): town; in the province of Pavia, Italy; district of Mortara (Lomellina); on the right bank of the Ticino, 24 miles S. W. from Milan; on the Mortara-Milan Railway (see map of Italy, ref. 3–B). The adjacent country is very fertile, and is famous for game. Vigevano is a well-built town, with a cathedral, churches, and palaces; and the castle, modified by Bramante under Ludovico il Moro, was a grand building, but is now used as cavalry barracks. The Piazza del Duomo is a large rectangular space flanked on three sides with porticoes supported by solid granite columns, the fourth being occupied by the cathedral. Vigevano was originally settled by a race of Ligurians; then it passed under Roman, Lombard, Gothic, and Frankish rule; governed itself independently for several centuries, after which, having been obliged to accept the Visconti and Sforza as lords, it shared the fortunes of Milan. It is now an active town, with manufactories of silk, velvet, linen, cotton, etc., and produces excellent macaroni. The town is the seat of a bishopric, and has excellent schools, one of which has a fine building of red granite. Pop. 20,100 (commune). Revised by Hermann Schoenfeld.

Vigfusson, vig'foos-sŭn, Gudbrand: Scandinavian scholar; b. at Frakkanes, Iceland, Mar. 13, 1827; educated in the schools of Bessastad and Reykjavik, and studied in the University of Copenhagen. He published *Timatal*, an essay in Icelandic on the chronology of the Icelandic sagas (Copenhagen, 1855); *Biskupasögur* (1858); *Fornsögur*, in conjunction with Th. Möbius (Leipzig, 1860); *Flateyarbók* (with Unger, Christiania, 1860–68); *Eyrbyggja Saga* (Leipzig, 1864); and other works. In 1864 he went to England, was from 1865 to 1874 engaged in completing the great *Icelandic Dictionary*, begun by Richard Cleasby, and published, in 1878, *Sturlunga Saga*, with a sketch of the literary history of Iceland as an introduction; in 1883, *Corpus Poeticum Boreale*, in conjunction with F. Yorke Powell, a collection of the poetry of the old Northern tongue from the earliest times to the thirteenth century, with translations, notes, and excursus (2 vols.). He also published (conjointly with F. Yorke Powell) *An Icelandic Reader* (1879). He was appointed Professor of Icelandic Language and Literature at Oxford in 1884. D. at Oxford, Jan. 31, 1889. Revised by Benj. Ide Wheeler.

Vigil [from Lat. *vigĭlia*, waking, watching, (later) watch on the eve of a day, eve, vigil; cf. Eng. *wake*]: in ecclesiastical language, the evening before any church fast, festival, or other important day of the calendar. Special services are appointed in the Roman Catholic Church for the more important vigils. Vigils are retained in the English calendar, but no particular service is directed for any one of them.

Vigil, Francisco de Paula Gonzalez: See Gonzalez Vigil.

Vigil'ius, Pope (537–555): a native of Rome; was appointed a deacon by Boniface II., and accompanied Agapetus to Constantinople in 536. Here Boniface died Apr. 22, 536, and by the intrigues of Theodora, Vigilius was appointed pope by Justinian, on the condition that he should lend his authority to those measures by which the emperor hoped to reconcile the Monophysites with the orthodox Church. On his return to Rome, however, he found the papal see occupied by Sylverius. He obtained the aid of the Byzantine commander at Ravenna, and Sylverius was expelled. Vigilius was a rapacious and ambitious man, without talent or character, and probably also without convictions. D. June 7, 555.

Vignaud, vin-yō', Henry: diplomat and author; b. in New Orleans, Nov. 27, 1830; teacher in public schools in that city 1852–56; also did journalistic work; edited at Thibodeaux, La., *L'Union de Lafourcher* 1857–60; aided in founding in New Orleans *La renaissance Louisianaise*, a weekly review; captain in the Confederate army during the civil war; in 1863 assistant secretary of the Confederate diplomatic commission in Paris; in 1869 secretary of the Roumanian legation in Paris; in 1872 official translator of the Alabama commission in Geneva; in 1873 U. S. delegate to the international metric conference, and in 1882 to the international conference for the protection of submarine cables; has been connected with the U. S. embassy in France since 1875, either as second secretary, first secretary, or *chargé d'affaires*. He published *L'Anthropologie* (1861), and has contributed memoirs to various learned societies. Theodore Stanton.

Vignola, Giacomo Barozzio, da: See Barozzo, Jacopo.

Vigny, vēēn'yee', Alfred Victor, Comte de: poet; b. at Loches, Indre-et-Loire, France, Mar. 27, 1799; entered the royal guard in 1816, but retired from military service in 1828, and devoted himself exclusively to literary pursuits. D. in Paris, Sept. 18, 1863. His *Poèmes* (1822), among which are *Hélène*, *La Fille de Jephté*, *La Femme adultère*, etc., and his *Poèmes antiques et modernes* (1824–26), among which are *Moïse*, *Le Déluge*, *Éloa*, *Dolorida*, etc., passed by almost

unnoticed, though they belong to the best which the romantic school has produced in France, and entitle him to rank among the first half-dozen French poets of the century. But in 1826 his historical novel *Cinq-Mars* attracted much attention, and was translated into various languages; and in 1835 his drama *Chatterton* made his name celebrated. He also wrote *Stello* (1832); *Servitude et Grandeur militaires* (1835), short stories tinged deeply with pessimism; *Les Destinées*, a philosophical poem, published after his death, etc. A complete edition of his works appeared in 6 vols. in 1863–66. See A. France, *Alfred de Vigny* (Paris, 1868); L. Dorison, *Alfred de Vigny* (Paris, 1892).

Revised by A. G. CANFIELD.

Vigo, vee'gō: town; province of Pontevedra, Northwestern Spain; beautifully situated on the Bay of Vigo; 20 miles by rail S. W. of Pontevedra (see map of Spain, ref. 13–A). It has some sardine and tunny fisheries. It is irregularly built, and old but picturesque, and its attractive surroundings are rich in wine, oil, and fruits. Pop. (1887) 15,044.

Vihāra, vĕē-haa'răă [Sanskr., pleasure, relaxation]: in post-Vedic times in India, a pleasure-ground or place of relaxation. After the rise of Buddhism the term was applied to Buddhist temples, these being at first only meeting-places for the Buddhist monks; but after images of Buddha began to be put up, and dwellings for the monks to be permanently erected around the image-house, the word *vihāra* was used, as it still is, to denote, first and more exactly, the temple itself, or, secondly and more generally, the whole monastic establishment. This usually consists, in all Buddhist countries alike, of one or more of the following buildings: (1) The image-house, containing one or more figures of Buddha, represented standing, sitting cross-legged, or lying on his side; before these images, or before the dāgaba, or before the bo-tree, the pious Buddhist goes through his simple worship, bowing with his palms placed together and raised to his forehead, repeating the creed or some moral sentences from the Buddhist books; (2) the dāgaba, a solid bell-shaped dome, sometimes of enormous dimensions, under which some relic of Buddha is supposed to be buried; (3) the sacred BO-TREE (*q. v.*), round which is raised a stone terrace; it is always supposed to be a descendant of the tree under which Buddha attained to Buddhahood, and holds the same position among the Buddhists as the cross does among Christians; (4) a *preaching-hall*; (5) an *assembly-hall* for the monks; and (6) their *sleeping apartments*. T. W. RHYS DAVIDS.

Viking, vī'king [from Icel. *vīkingr*, deriv. of *vīk*, bay, inlet, creek; named from using the creeks and fiords as lurking-places. According to this derivation, it may also mean "the men from the fiords." The fact that the old Irish called the Norsemen Lochlennoch and Norway Lochlan is a curious coincidence. The Norwegian linguist S. Bugge suggests the derivation *vig-gengr*—i. e. one going to slaughter—in which case viking means simply warrior]: the name applied to those vast numbers of Scandinavian naval warriors who, in the ninth and tenth centuries, made the waters of Europe, and particularly those of Western Europe, unsafe. The ninth and tenth centuries are usually styled the viking age. The Scandinavian vikings were excellent ship-builders and expert seamen. By the aid of the sun, moon, and stars they were able to navigate in the open sea. They were the first to venture out of sight of land in ships, and thus became the discoverers of pelagic navigation. None other than coast navigation had ever been attempted by any people before the vikings found their way across the open North Sea to Great Britain, to the Faeroes, to Iceland, Greenland, and Vinland. The occupation of the viking was regarded as a highly honorable one. The viking went in search of "fee and fame," wealth and reputation. RASMUS B. ANDERSON.

Vilaine, vĕē'lān': a river of France; rises in the department of Mayenne, flows W. and S. S. W., and enters the Atlantic Ocean at Penestin, in the department of Morbihan. Its length is about 130 miles, and it is navigable 80 miles.

Vilas, vī'lăăs, WILLIAM FREEMAN: U. S. Senator; b. at Chelsea, Vt., July 10, 1840; removed in 1851 to Wisconsin; was educated at the University of Wisconsin; studied law and began practicing in Madison; fought in the civil war as colonel of the Twenty-third Regiment of Wisconsin Volunteers: returned to his law business after the close of the war, and took an active part in politics. He became Postmaster-General in 1885 and was Secretary of the Interior 1888–89. In 1891 he was elected U. S. Senator.

Vilayet: a province of Turkey, ruled by a vali. The corresponding division in former times was called an eyalet.

Vilers, vĕē'lār', CHARLES MARIE LE MYRE, de: diplomatist; b. in France in 1833; began his career in the navy in 1849; subsequently entered the civil service and proceeded to Algeria. In 1879 he was appointed civil governor of Cochin-China, where he suppressed an insurrection and introduced several reforms. He was recalled to France in 1882, and in 1888 he was sent to Antananarivo as minister plenipotentiary. There he distinguished himself by his patriotic resistance to British interests and missionaries in Madagascar, and finally succeeded in obtaining the consent of the Hova Prime Minister to his demand that the French plenipotentiary should have the right to grant the exequatur to the representatives of foreign countries. For these services he was promoted to be grand officer of the Legion of Honor. In 1889 he was elected deputy for Cochin-China, and in 1893 went to Siam, where he successfully negotiated a convention. In 1894 he returned to Madagascar, where, with the object of reducing that country to the position of a French dependency, he made demands which led to the invasion of the island in 1895.

Villa Bella de Goyaz: See GOYAZ, VILLA BELLA DE.

Villa Encarnación: See ITAPUÁ.

Villafran'ca: a small town of Northern Italy; about 11 miles S. of Verona and 12 miles N. of Mantua (see map of Italy, ref. 3–D). It is a well-built and flourishing town, with a fine castle of the fourteenth century. Here (July 11, 1859) Napoleon III. terminated the war he had begun against Austria "to liberate Italy from the Alps to the Adriatic," by negotiating, without the knowledge of his ally, King Victor Emmanuel, a preliminary treaty with the Emperor of Austria, by which, though Lombardy was taken from the Austrians, they retained Venetia. These provisions were afterward ratified in the treaty of Zurich. Pop. 3,990.

Villages and **Village Communities**: See the Appendix.

Villagran, vĕēl-yăă-graan', or **Villagra**, FRANCISCO, de: soldier and governor of Chili; b. at Astorga, Leon, Spain, in 1507. He was with VALDIVIA (*q. v.*) in Peru, and one of his principal lieutenants in the conquest of Chili (1540–45). While Valdivia was in Peru, 1547–49, Villagran acted as deputy governor; during this period he condemned Pedro Sanchez de Hoz to death for instigating a rebellion. Subsequently he was prominent in the Indian wars, and when Valdivia was killed in the great Araucanian uprising of 1553–54, he assumed the governorship in accordance with a previous arrangement. He immediately marched against the Araucanians, but was disastrously defeated at Mariguenu Feb., 1554, and soon after was forced to abandon Concepcion. Having received re-enforcements, he marched to the succor of Valdivia and Imperial, the only Spanish posts remaining in the Araucanian country. The Indian forces being scattered, he was able to carry on a war of extermination for many months. In 1556 he defeated and killed the celebrated chief Lautaro at Mataquito. The new governor, Garcia Hurtado de Mendoza, arrived in Apr., 1557, and immediately sent Villagran a prisoner to Peru, ostensibly because he had held command without authority, but really to get rid of him. He was released, went to Spain, and in 1561 returned to Chili with a royal commission to succeed Mendoza. During his term conquests were continued beyond the Andes, and there were new troubles with the Araucanians, in which Villagran's son was killed. D. in office at Concepcion, July 15, 1563. H. H. S.

Villain: See VILLEIN.

Villalobos, vĕēl-yăă-lō'bōs, FRANCISCO LOPEZ, de: author; b. in Toledo, Spain, 1473; was perhaps of Jewish extraction; studied medicine and became physician to Ferdinand the Catholic and Charles V. successively. D. probably several years before 1549. Some of his writings deal with medicine as practiced according to the principles of the time, and therefore have little value now. More important than these are several works of a didactic nature, such as *Problemas* (1515), the *Tratado de los Tres Grandes Vicios*, and the *Canción* with its gloss. The plan of the *Problemas* resembles that of Dante's *Convivio*. In forty-one meters Villalobos proposes *problems* in physics or morals, which he seeks to solve in a gloss appended to each meter. The *Tratado* treats of the three great vices of loquacity, disputation, and excessive laughter; and the *Canción*, written, it is said, when the Empress Isabella died, bids farewell to the world and welcomes death. A noteworthy addition to the

Spanish drama is his *Anfitrion*, a translation of the comedy of Plautus; it seems, however, never to have been appreciated. See A. M. Fabié, *Vida y escritos de F. L. de V.* (Madrid, 1886); *Biblioteca de autores españoles*, vol. xxxvi., 405 ff. J. D. M. Ford.

Villa'ni, Giovanni: historian; b. at Florence about 1275; occupied a prominent place in his native city, and held various offices, military and diplomatic, as a member of the Guelph party. D. at Florence from the plague in 1348. He wrote a chronicle of Florence, *Cronaca Fiorentina*, in 12 books, from biblical times to 1346, to which his brother Matteo added a thirteenth book, carrying the narrative down to 1363. Matteo's son Filippo also wrote a continuation. According to the style of composition then reigning; this history of Florence is also a history of the world, but whenever the author speaks of Florence or of his own time, the book is considered to have great historical value. Its principal merit, however, is its simple and noble style. See U. Balzani, *Early Chronicles of Italy* (1883).
Revised by F. M. Colby.

Villanovanus, Arnaldus: See Arnaldus Villanovanus.

Villanueva, veĕl-yaă-nwā'vaă, Joaquin Lorenzo: patriot, poet, and scholar; b. at Jativa, Valencia, Spain, Aug. 10, 1757; took orders, and was court preacher and confessor to the king when, in 1808, the revolution took place. Then he represented his province in the Cortes and advocated the principles of the constitutionalists, on which account, after the return of the king (1814), he was confined for six years in the monastery of Saleeda. Again in the Cortes after 1820, he conferred with the pope on behalf of his party in 1822; and in 1823, upon the return of Ferdinand, fled to Ireland. D. in Dublin, Mar. 26, 1837. His principal works are *El año cristiano de España* (19 vols., Madrid, 1791–99); the treatise *De la lección de la Sagrada Escritura en lenguas vulgares* (Valencia, 1791), in which he took occasion to assail the Inquisition from the political side; *La angélicas fuentes ó El Tomista en las Cortes*, a defense of constitutionalism based upon arguments drawn from St. Thomas Aquinas; and his *Poesías escogidas* (London, 1833; printed in the *Biblioteca de autores españoles*, lxvii., p. 583 ff.). Also noteworthy are the essay *Ibernia phœnicæa, sen Phœnicum in Ibernia incolatus* (Dublin, 1831; trans. *Phœnician Ireland*, London, 1832), on Irish antiquities, and his autobiography (London, 1825). Another work, translated into English (London, 1825), bears the title *Observations on the Answers of Doyle, Titular Bishop of Kildare and Leighton, to the Committee of the House of Commons* (concerning the discipline and government of the Roman Catholic Church).
J. D. M. Ford.

Villa Real, veĕl'yaă-rā-aal': an old but handsome and regularly built town of Spain, province of Castellon; on the Mijares, near its mouth in the Mediterranean (see map of Spain, ref. 16–I). It has distilleries and factories of woolen fabrics. Pop. (1887) 13,750.

Villa'ri, Pasquale: author; b. at Naples, Italy, Oct. 3, 1827. Educated in his native city under Basilio Piroti and de Sanctis, he took an active part in the Neapolitan revolution of 1848–49, and on its failure was obliged to flee to Florence. Here he lived in needy circumstances, giving private lessons and devoting himself to the study of history. After some years the fruit of his efforts appeared in the work *Storia di Girolamo Savonarola e de' suoi tempi* (2 vols., 1859–61; Eng. trans. by his wife, Linda Villari), which at once obtained recognition throughout Europe and brought the author an appointment as Professor of History in the University of Pisa (1859). During the next years Villari produced a number of treatises, some critical and educational, others inspired by his eager interest in the political welfare of Italy. Among these may be mentioned *La civiltà latina e germanica* (1861); *Leggende che illustrano la Divina Commedia* (1865); *Saggi critici* (1868); *Scritti pedagogici* (1868); *Arte, storia, e filosofia* (1884); *Nuovi scritti pedagogici*; and the pamphlet *Di chi è la colpa?* The last, written in 1866, after the national disasters of that year, deeply moved the Italians by its admonitions and warnings as to their own moral and political shortcomings. In this same year, 1866, Villari was drawn from Pisa to the chair of History in the Istituto di Studj Superiori at Florence, which he has since held, except when called away by duties of a public character. In 1869 he was general secretary of Public Instruction; in 1884 he was made senator; in 1891 he was Minister of Public Instruction; he has several times been deputy in the Italian Parliament. Despite these engrossing professional and public labors, however, Villari has continued to be an earnest historical investigator and writer. In 1877–82 appeared his *Niccolò Machiavelli e i suoi tempi* (3 vols.; Eng. trans. by Linda Villari, rev. ed., 2 vols., London, 1892), a work of first-rate importance. In 1878 he published *Le lettere meridionali ed altri scritti sulla questione sociale in Italia*; in 1890, *Le origini del comune di Firenze* (in the volume *Gli Albori della vita italiana*); and *Saggi storici e critici*. In 1893–94 appeared *I primi due secoli della storia di Firenze* (2 vols., Florence; Eng. trans. by Linda Villari, entitled *The Two First Centuries of Florentine History*, London and New York, 1894). Deserving of mention is his edition of the *Dispacci di Antonio Giustiniano, ambasciatore veneto in Roma dal 1502 al 1505* (3 vols., 1876). A. R. Marsh.

Villa Rica, veĕl'yaă-ree'kaă: a town of Paraguay, 92 miles by rail E. S. E. of Asuncion; near the forest-covered edge of the plateau or so-called mountain district (see map of South America, ref. 7–E). It is the most important place in the interior of the republic, the center of a fertile agricultural district which is especially noted for its tobacco, and the market most frequented by gatherers of *maté*, or Paraguay tea. Pop. about 12,000. H. H. S.

Villars, veĕ'laar', Claude Louis Hector, Duc de: marshal of France; b. at Moulins, department of Allier, France, May 8, 1653; was educated as a page at the court of Louis XIV.; entered the army in 1672; fought with distinction under Turenne, Luxembourg, and Créqui; was also employed with great success in diplomatic negotiations, especially as ambassador to Vienna, 1699–1701, and received in 1702, in the Spanish war of succession, his first independent command. Oct. 14, 1702, he defeated Prince Louis of Baden at Friedlingen, and was made a marshal; next spring he penetrated through the passes of the Black Forest and joined the Elector of Bavaria, but although, on Sept. 20, 1703, he won a new victory over the imperial forces under Styrum at Höchstädt, he nevertheless resigned his command and returned to France, disgusted at the follies of his ally, the elector. Having distinguished himself greatly at various points in the theater of war as a commander of minor corps, he succeeded Vendôme in 1709 in the command of the grand army in the Netherlands, numbering 120,000 men, but was defeated and severely wounded at Malplaquet Sept. 12, 1709. Having recovered, he again took command of the grand army, now the last which France was able to raise, and gained a brilliant victory over the allied English-Austrian force under the Earl of Albemarle at Denain July 24, 1712, which contributed much to the conclusion of the Peace of Utrecht. After a successful diversion against Prince Eugene, he finally negotiated and signed the Treaty of Rastadt (Mar. 6, 1714). During the regency and the reign of Louis XV. he continued to have much influence on the foreign policy and all military affairs, and when, in 1733, a war with Austria broke out, he was placed in command of the army in Northern Italy and received the title of marshal-general. Although eighty-one years old, he still displayed remarkable energy; but disagreement with the King of Sardinia caused him to resign his command. D. at Turin, June 17, 1734. His *Mémoires*, published after his death, are only partially genuine. His biography has been written by Anquetil (1784), Giraud (1881), and de Vogüé (1888).
Revised by F. M. Colby.

Villefranche, veĕl'fraăñsh': town; department of Aveyron, France, at the confluence of the Aveyron and the Alzon (see map of France, ref. 8–F). It has iron-works and manufactures of copper-ware. Pop. (1896) 8,426.

Villefranche-sur-Saône, -sür-sōn': town; department of Rhône, France; on the Saône, 20 miles N. W. of Lyons (see map of France, ref. 6–H). It manufactures cottons, spirits, leather, and trades in cattle and Beaujolais wine. Pop. (1896) 13,627.

Villegaignon, veĕl'gā'nyōṅ', Nicolas Durand, Chevalier, de: adventurer and colonizer; b. in Provence, France, in 1510. He was early noted for his exploits by land and sea, fought against the Turks and Algerians, and is said to have conveyed Mary Queen of Scots from Dumbarton to France in 1548. In 1555 he was chosen by Coligny to found a French colony in Brazil, the admiral hoping not only to gain a foothold in South America, but also to attract French Protestants thither by securing to them the free exercise of

their religion. Villegaignon left Havre on July 12, 1555, with two ships, and in November occupied and fortified the island still known by his name in the Bay of Rio de Janeiro. Friendly relations were established with the Indians, but dissensions soon broke out between the the Roman Catholic and Protestant colonists, and these were increased on the arrival of re-enforcements and Protestant missionaries. Villegaignon, whose acts were ill-judged and often tyrannical, finally expelled the Calvinists, and some of them died of starvation during their return to France. He himself went to France in 1559 to seek re-enforcements, but never returned, and in 1667 the colony was broken up by the Portuguese. D. near Nemours, Jan. 9, 1571. H. H. SMITH.

Villegas, vēĕl-yā'găăs, ESTEBAN MANUEL, de: poet; b. at Najera, Old Castile, Spain, in 1595; received a good classical education in Madrid; studied law at Salamanca; remained poor all his life, and died, the incumbent of a small office in his native town, Sept. 3, 1669. The influence of the classics worked very strongly upon him, and caused him to oppose with vigor the movement of Lope de Vega and his school. The beauty of his poems, which are mostly erotic and in the spirit of Horace and Anacreon, has long been recognized. They appeared under the title of *Amatorias*, at Najera, in 1618, and together with a translation of the *De Consolatione Philosophiæ* of Boethius, have been several times reprinted. See the edition by Vicente de los Rios, *Las eróticas y traducción de Boecio*, 2 vols., Madrid, 1774 (has a good life prefixed); and that by M. J. Quintana, *Poesías selectas*, Madrid, 1807, especially vol. i., pp. 348–378; also *Biblioteca de autores españoles*, vol. xlii., pp. 552 ff. J. D. M. FORD.

Villehardouin, vēĕl'ăăr'doo-ăń', GEOFFROY, de: historian; b. at the castle of Villehardouin, near Troyes, in Champagne, France, about 1160. Almost all that is known of his life is gathered from his chronicle, the *Histoire de la Conquête de Constantinople*, which is one of the chief historical works of the Middle Ages, and the earliest chronicle written in the French language. It narrates the story of the fourth, or, as some historians reckon it, the fifth crusade (1202–04) which, diverted from its original purpose, never reached the Holy Land, but became a mere chivalrous enterprise for the capture of Zara and Constantinople. Villehardouin took the cross in 1199, and was one of the deputies to negotiate with the Venetians for ships to transport the crusaders. He fought at the siege of Constantinople, but seems to have been especially distinguished for his skill as a diplomatist, being employed in many difficult negotiations with the Eastern court and in the settlement of disputes among the crusaders themselves. After the establishment of the Latin Empire he was appointed marshal of Romanie, fought with honor against the Bulgarians and in the naval battle at Cibotus, and received for his services the fief of Messinople. From this time little is known of his career. The date of his death is uncertain, but is thought to be 1213. The *Histoire de la Conquête de Constantinople*, which covers the period from 1198 to 1207, is the best picture that has been preserved of the life and spirit of the age of chivalry. The first printed edition extant is dated 1585. Another appeared at Lyons in 1601, but the best of the earlier editions is that of du Cange (1657). The best modern edition is by Natalis de Wailly (1872–74; 3d ed. 1882). See Sainte-Beuve, *Causeries de Lundi*, vol. ix. F. M. COLBY.

Villein, or **Villain** [from O. Fr. *vilein*, *vileir* < Late Lat. *villa'nus*, farm-servant, deriv. of Lat. *vil'la*, farm]: primarily and strictly, the servile peasant of the feudal era in England; in a secondary and wider sense, any person, bond or free, who held land by the tenure or upon the conditions of the servile peasantry. The term *villanus*, adopted and fixed by the *Domesday Book*, is constantly employed in this double sense in the manorial and legal records of the thirteenth and fourteenth centuries.

At no time during the Middle Ages was the Christian society of Europe free from servile elements. The feudal system did not create, nor, as is commonly supposed, did it necessarily involve the existence of a servile class. On the contrary, that system found unfree men in every country of Europe, from the Anglo-Saxon thrall and Danish bondman (*bondus*) to the *servi* and *coloni* of the Mediterranean states. Moreover, it was solely by the operation of the laws governing the development of feudal society, and not as a result of humanitarian enterprise, that these servile classes were gradually transformed into a free peasantry. If it is true that in no country of Europe was this process of emancipation more rapidly effected and attended with more beneficial and permanent consequences than in England, it is no less true that nowhere else did the feudal system have so rapid and complete a triumph. The truth is that there was no room for serfdom in the feudal organization of society. This society had not an industrial, but a military basis, and the services which it required were easily obtainable from, and could in general be better performed by, free men than by the unfree. It is obvious that a social order in which the most personal and menial services are voluntarily performed by free men as a part of the service which they owe for their tenure of lands (see TENURE) has no interest in maintaining a distinct class of servile dependents. This characteristic of the feudal system is well illustrated in the status of the villein and in the history of his relations to the society and to the soil to which he appertained.

It should be said, in the first place, that the villein, though a bondman, was not a slave. The man who held him in subjection was his lord and master, but not his owner. The villein was not a chattel, nor, indeed, was he property of any kind, although, being attached to the manor (*adscriptus glebæ*), he constituted a sort of appurtenance to the soil. He could not as an individual be sold and removed from the land to which he belonged, but if the land was sold he passed with it under the dominion of the new tenant or lord. He could acquire no property, real or personal, which his lord could not assume at pleasure; he was obliged to perform a variety of services which, though not necessarily menial in themselves, were regarded as the badge of his servile condition; the same may be said of certain payments which he was compelled to make to his lord (as *merchet*, or the fine for marrying his daughter), and which, though not differing very widely from the more burdensome incidents of free tenure, were regarded as the tribute of a bondman. Moreover, he could not lawfully leave the manor to which he belonged, and he held the cottage and plot of ground which he possessed completely at the will of his lord.

On the other hand, it was only in these personal relations to the lord and as an appurtenance of the manor that the villein was subjected to the conditions of servitude. As regarded all other persons and, under some circumstances, even in his relations to his lord, he had the legal status of a freeman. The king's courts were open to him and the king's law protected him as well from breach of contract by his lord, as from the forfeiture of his *wainage*, or instruments of labor, and from injury to life and limb. As to all other persons he could acquire, hold, and transmit real and personal property, and could maintain all the usual actions at law for its defense and recovery. Moreover, as Medley (*English Constitutional History*) has expressed it, "beyond the bounds of the manor and away from the power of the lord the influences which made for freedom were irresistibly strong." There was considerable migration, notwithstanding the efforts that were constantly made to restrain it, and once away from his manor a villein was regarded as a freeman. If his lord attempted to recover him he had the common-law presumption in favor of freedom to overcome, and could succeed only by indisputable proof of the servile status of the ancestors of the person claimed. It was not enough to show that the latter was a fugitive from the plaintiff's manor, and that he had there occupied the position of a villein. If a villein took holy orders, or if he lived for a year and a day in a chartered town, or if his lord enfeoffed him of a freehold, he became a free man.

Such was in legal theory the status of the villein. But it must be remembered that when we speak of legal theory we mean the doctrine of the king's courts, and that these courts stopped at the threshold of the manor. The internal affairs of the manor, especially the relations of the villeins to the lord and the land, and the terms and conditions on which they possessed their holdings, were, in theory at least, wholly within the control of the lord of the manor. In fact, however, it must always have been true that these matters were largely regulated and determined by the custom of the manor, and when that custom found official and effective expression through the manorial courts it came to have very much the effect of real law in determining the relations of the lords to their villein tenants. In this way then, by the recognition of the binding force of manorial custom, the status of the villein tenant came to have some of the characteristics of a lawful tenure, which under the description of villeinage was enjoyed by many persons who were not villeins in fact. It is, of course, in what has been described above as the secondary sense of the term villein that we find such expressions employed as a "full villein," a "half vil-

lein," and the like, referring not to the personal status of the individual in question, but to the size of the plot of ground held by him, the normal ("full") villein tenement being a *virgate* (about 30 acres), or one-fourth of a *hide* (120 to 180 acres). "It was on these two units, the hide and the virgate," says the authority from whom quotation was made above, "that all calculations of services were made; and, although the acquisition of villein land by freeholders and *vice versa* must necessarily have slightly altered the position of the lord toward the individual holders, the duties remained as a fixed quantity entered in the manorial rolls and subject neither to increase on the part of the lord nor to substantial diminution on that of the tenant." When the conditions of villein tenure reached the state here described, nothing was needed to convert it into one of the recognized forms of free tenure but its adoption by the courts of common law. See TENURE.

For brief but trustworthy accounts of the villein, especially in his legal relations, consult Digby, *History of the Law of Real Property*; Medley, *English Constitutional History*; and Pollock and Maitland, *History of English Law*; for his industrial and social position, see Andrews, *The Old English Manor*, and Ashley's *English Manor* (in the English edition of Fustel de Coulange's *Origin of Property in Land*). The whole question has been most thoroughly considered, from the legal as well as the industrial and social side, by Prof. Paul Vinogradoff, in his work on *Villainage in England*. GEORGE W. KIRCHWEY.

Villèle, vēē'lāl', JEAN BAPTISTE SÉRAPHIN JOSEPH, Comte de: statesman; b. at Toulouse, department of Haute-Garonne, France, Aug. 14, 1773; entered the navy in 1791; went to the West Indies, and remained there during the Revolution; returned in 1807 with a fortune, and settled in his native city; was elected a member of the Chamber of Deputies in 1815, and became in a few years the leader of the ultra-royalist party. After the murder of the Duc de Berry and the fall of Decazes in 1820 he entered the cabinet as minister without a portfolio, and became Minister of Finance in 1821, and president of the council in 1822. An able financier, he brought the finances of France into an orderly shape; but his reactionary measures made him very odious to the people, without fully satisfying the court. In 1823 occurred the war with Spain for the reinstatement of Ferdinand VII., the complete success of which gave him a strong majority in the elections of 1824. Taking advantage of the popularity of the ministry, he tried to secure an indemnity of one milliard to the *émigrés*, and the measure, at first rejected by the House of Peers, was finally voted after the accession of Charles X. Among the other measures of his administration were the lowering of the interest on the public debt to 3 per cent., the prolongation of the electoral term for the Chamber of Deputies to seven years, the re-establishment of the right of primogeniture, the limitation of the freedom of the press, the law of sacrilege, and the dissolution of the national guard of Paris. In Jan., 1828, he was compelled to give way to the cabinet of Martignac. He was created a count when he entered the ministry, and a peer when he left it. After 1829 he lived in retirement in Toulouse, and died there Mar. 13, 1854. F. M. COLBY.

Villemain, vēēl'măn', ABEL FRANÇOIS: scholar and critic; b. in Paris, June 11, 1790; studied first law, afterward literature and philosophy; was appointed Professor of Rhetoric at the Lycée Charlemagne in 1810; won the prize of the Academy three times—in 1812, 1814, and 1816—for his *Éloge de Montaigne, Avantages et Inconvénients de la Critique*, and *Éloge de Montesquieu*; published in 1819 his *Histoire de Cromwell* (2 vols.); received in 1820 a position in the Department of the Interior as *chef de l'imprimérie et de la librairie*, and was shortly after made *maître des requêtes* to the council of state. His connection with politics soon carried him into the ranks of the opposition, and in 1827 the Academy, to which he had been chosen in 1821, commissioned him, together with Lacretelle and Chateaubriand, to draw up its protest against the re-establishment of the censorship of the press. He now lost his position in the Government, but his lectures at the Sorbonne gathered immense audiences, and greatly contributed, like those of Guizot and Cousin, to foment the movement which terminated with the Revolution of 1830. In 1831 he became a member of the council of public instruction; in 1832 was created a peer and chosen perpetual secretary of the Academy; in 1839–40 and 1840–44 was Minister of Public Instruction. But of all the *doctrinaire* leaders he proved the one least fitted for actual government. Unable to take or to keep a firm position between the conflicting interests of the Church and the university, the liberals and the conservatives, etc., he resigned his office in 1845, and retired altogether from politics in 1848, devoting himself exclusively to literature. He is especially known for his criticism, which by its brilliancy, breadth, and wide sympathy was a powerful force in French letters in the period of romanticism. Among his works are *Cours de Littérature française* (5 vols., 1828–29; later editions 6 vols.); *Discours et Mélanges littéraires* (1823); *Études de Littérature ancienne et étrangère* (1846); *Souvenirs contemporains d'Histoire et de Littérature* (1856); *Histoire de Grégoire VII.*, with an introductory chapter on the history of the papacy (2 vols., 1873). All these except the last he altered and enlarged in later editions. D. in Paris, May 8, 1870.

Revised by A. G. CANFIELD.

Villena, vēēl-yā'nă, Don ENRIQUE DE ARAGON, Marqués de (title of marquis disputed): author; b. in Spain in 1384; was a scion of the royal family of Castile and Aragon. Deprived of his estates by Henry III. of Castile, he was made grand-master of the Order of Calatrava; but was deposed in 1407, and left in want until relieved by the Queen Regent of Castile, who gave him the small seigniory of Iniesta. D. in 1434. Eager for knowledge, he plunged into all the known sciences, particularly into astrology, on account of which he gained the ill repute of being a sorcerer. The belief in his nefarious character led to the burning of most of his books after his death. He favored the Provençal poetic art, advocating its principles in two treatises, the *Capítulos del Gay Saber* and the *Arte de Trovar*, and upholding the *Consistorio del Gay Saber* of Barcelona. He admired Dante, and made a translation of the *Divina Commedia*, in 1428 (lost). Above all, he heralded the Renaissance by translating the *Æneid* (nine books preserved) and other Latin classics, and by drawing from them in the poem *Façañas de Ércoles* (lost), and the prose moralization, the *Doce Trabajos de Hércules*. The last named and a treatise on carving, the *Arte cisoria*, are extant. J. D. M. FORD.

Villeneuve-sur-Lot, vēēl'nōv'sür-lō': town; department of Lot-et-Garonne, France; on the Lot, which here is crossed by a remarkable bridge (built in the thirteenth century) which spans the river by one single arch (see map of France, ref. 8–E). The chief manufactures are faïence, tiles, and bricks, and a lively trade in wine, fruits, and other products of the adjoining districts is carried on. Pop. (1896) 13,561.

Villers, vēē'yā', CHARLES FRANÇOIS DOMINIQUE, de: soldier and author; b. at Boulay, Lorraine, Nov. 4, 1765; educated at the school of artillery in Metz, and entered the army in 1782, but emigrated in 1793; served for a short time in the army of Condé; lived in various places in Germany, and settled in 1797 in Lubeck, devoting himself to literature. He published *La Philosophie de Kant* (2 vols., Metz, 1801; 2d ed. Utrecht, 1830–33); *Essay on the Spirit and Influence of the Reformation of Luther* (Paris, 1804; 5th ed. 1851; Eng. trans., London, 1805; abridged ed. 1836); *Coup d'œil sur les Universités de l'Allemagne protestante* (1808); but his *Lettre à Madame la Comtesse Fanny de Beauharnais*, in which he describes the atrocities committed by the French soldiers at the storming of Lubeck in 1806, drew upon him the hatred of the French army, and exposed him to many persecutions. On the annexation of the Hanseatic cities to France in 1811, he removed to Göttingen, where he died Feb. 26, 1815. Revised by S. M. JACKSON.

Villiers, vil'yērz, CHARLES PELHAM, P. C.: statesman; b. Jan. 3, 1802; brother of the fourth Earl of Clarendon (see CLARENDON, GEORGE); educated at Haileybury and St. John's College, Cambridge; called to the bar at Lincoln's Inn 1827; became a member of the House of Commons for Wolverhampton as a free-trader in 1835 and retained his seat, being returned in 1892 as a Liberal-Unionist; appointed judge-advocate-general 1853; president of the Poor-law Board 1859–66; became a member of Palmerston's second administration in 1859. He was one of the leaders of the anti-corn-law agitation, and introduced and carried through Parliament the Union Chargeability Bill (1865). A marble statue of Villiers was unveiled at Wolverhampton 1879, and his jubilee as member for the borough was celebrated in 1885. D. in London, Jan. 16, 1898.

Villiers, FREDERIC: journalist; b. in London in 1852; was educated in France; studied in the South Kensington schools of art and at the Royal Academy. In 1876 he was

special artist and correspondent of *The Graphic* in the campaign in Servia, and throughout the Russo-Turkish war 1877–78. In the latter year he went to Afghanistan, and was present during the military operations there until the signing of the treaty of Gandamuk. In 1882 he left England for Egypt; was on board H. M. S. Condor during the bombardment of Alexandria, and was present during the Egyptian campaign, receiving the order of the Medijieh and the khedive's medal. In 1884 he went to Suakim, and was present during the operations against the Arabs, and in the following year he accompanied the expedition for the relief of Khartoum. He then accompanied the Servian forces in their campaign with the Bulgarians, and immediately afterward went to Burma in the service of *The Graphic*. During the Chinese-Japanese war of 1894–95 he was correspondent of *Black and White*. Since 1887 he has delivered lectures on his varied experiences in England, the U. S., and Canada.

Villiers, George: See Buckingham, George Villiers, Duke of.

Villiers, George William Frederick: See Clarendon.

Villis'ca: city; Montgomery co., Ia.; at the junction of the east and west branches of the Nodaway river; on the Chi., Burl. and Quincy Railroad; 16 miles N. of Clarinda, and 18 miles E. by S. of Red Oak (for location, see map of Iowa, ref. 7–E). It has 7 church organizations, high and grammar schools with 14 teachers and nearly 600 pupils, water-works, an electric-light plant, a national bank with capital of $50,000, a private bank, and 2 weekly newspapers. Fire, paving, and building brick and tile are made from large local deposits of soapstone and clay. The city is a shipping-point for live stock, grain, fruit, butter, poultry, and eggs. Pop. (1880) 1,299; (1890) 1,744; (1900) 2,211.
Editor of "Letter."

Villoison, vēē'wää'zōń', Jean Baptiste Gaspard d'Ansse, de: Greek scholar; b. at Corbeil-sur-Seine, France, Mar. 5, 1753; became a member of the Académie des Inscriptions at the age of twenty-three; was sent by the French Government to Venice to examine the MSS. of the library of St. Mark. The *Anecdota Græca* (2 vols., 1781) embodies the results of his study, the most famous being the publication, with learned comments, of the *Codex Venetus*, containing the text of Homer and the *scholia* which furnished F. A. Wolf with material for his *Prolegomena*. The iconoclastic nature of this treatise of the German scholar is said to have so disturbed Villoison that he ever afterward regretted the publication of these *scholia*. Villoison subsequently traveled through Greece (1785–88). The French Revolution having broken out shortly after his return to Paris, he was banished, with others of the nobility, to Orleans. In 1800 he was recalled as professor at the Collège de France. D. in Paris, Apr. 26, 1805. Other noteworthy publications, are his edition of the *Homeric Lexicon* of Apollonius (2 vols., 1773) and Longus's *Pastoralia*. See Daeier, *Notice historique sur Villoison* (1806); Chardon de la Rochette, *Mélanges des critiques* (vol. iii., pp. 1–61). Alfred Gudeman.

Villon, vēē'lōń', François: poet; b. in Paris in 1431. His real name was de Montcorbier, and he had several aliases, the name he is known by being taken from a benefactor, Guillaume de Villon. He studied at the university, and became a master of arts in 1452. In 1455, in consequence of having killed a priest in a street brawl, he was obliged to flee, and was sentenced to banishment. On proof that he had been attacked by the priest he received a pardon in the following year. He now devoted himself to writing his *Petit Testament*. But he was soon in trouble again, this time of the *cherchez la femme* kind, and he fled to Angers. Henceforward his life was such as has been associated with his name; whether it was caused by the pressure of want or the conviction that his ridding the world of a worthless priest had rendered the Church his enemy we have no means of knowing. Shortly after his arrival at Angers the chapel of the college of Navarre was robbed of 500 crowns, and the theft was traced to a band of student robbers, one of whom accused Villon of being their leader, and asserted that he had planned similar burglaries at Angers. Villon was caught, tortured, and with five others was sentenced to be hanged. On this occasion he composed his *Ballade des Pendus*, an epitaph by anticipation on himself and his comrades swinging on the gibbet. He escaped this picturesque fate, however, by appealing to the parliament of Paris, which, perhaps on the intercession of a friend, commuted his sentence to banishment. Of the next four years of his life we have little information, but on his reappearance in 1461 he is found spending the summer in the prison of the Bishop of Orleans at Meung. His crime was probably sacrilege or burglary. This time he owed his escape to a jail delivery at Meung on the accession of Louis XI. He now wrote his last and greatest work, his *Grand Testament*, and it is probable that he did not survive much longer, worn out, as he admits himself to be, by excesses, prison life, and perhaps consumption.

Villon's poetry may be considered as marking an era in the literature of Europe. In it we find the personal note, so wanting before his time, a strong capacity of feeling and expression, and a mournful tone, arising from the poet's sense of the vanity of the joys of mere life and perhaps from his own hopeless immersion in vice. It has thus proved intensely interesting and even attractive, in spite of its realistic atmosphere of libertinism, which at least is not assumed, as in the case of a modern school of eccentric poets. Besides the two testaments, there are a number of ballads, among which is the well-known *Ballade des Dames du Temps Jadis*, with its burden of *Mais où sont les neiges d'antan*. In addition, there is a collection in argot, partly due to him, called *Le Jargon* (it is mostly unintelligible at the present day), and *Les Repues Franches*, a series of stories dealing with the cheating of tavern-keepers, etc., many of them probably written before Villon's time.

The first dated edition of Villon's poems is of 1489, and numerous editions have been published since, especially in the eighteenth century. See A. Longnon, *Étude Biographique sur François Villon* (1877); W. Bijvanck, *Essai Critique sur les œuvres de François Villon* (Leyden, 1883). English translations have been made by John Payne (1878; expurgated ed. 1881), Swinburne, Andrew Lang, and others.
R. A. Roberts.

Vil'na, or **Wilna** (Polish *Wilno*): general government of Western Russia, formerly the grand duchy of Lithuania; area, 16,421 sq. miles. It is mostly level, broken at places by low hills of clay and sand, but often occupied by marshes and lakes or covered with extensive forests. The climate is mild and damp in summer, but severe in winter. The soil is generally fertile and produces rye, barley, oats, potatoes, flax, hemp, and tobacco. These products, together with timber, honey, wax, tar, potash, skins of elks, bears, wolves, and martens, are the principal articles of export. The Niemen and its tributary, the Wilija, and the Dwina are the chief channels of trade. Pop. (1897) 1,591,912. H. S.

Vilna (Polish *Wilno*): capital of the general government of Vilna, Russia, and a great railway center; on the Wilija; 436 miles S. W. of St. Petersburg (see map of Russia, ref. 7–B). It has very few manufactures, but an extensive trade in grain and timber. Vilna was the capital of Lithuania from 1323, when the Lithuanian state extended from the Baltic to the Black Sea, and is still very rich in historical monuments and associations. Its university, founded by Stephen Bathori in 1576, was suppressed after the revolution of 1830; but a medical academy and an astronomical observatory still exist, besides two gymnasiums, religious seminaries, and a museum with a public library and valuable historical collections. The Cathedral of St. Stanislaus contains the silver sarcophagus of St. Casimir. Among the twenty-two Roman Catholic and about a dozen Greek churches are several magnificent, old, and historic buildings. Vilna's scientific societies are among the most noted in the Slavonic world. Pop. (1897) 159,568, chiefly Polish. H. S.

Vimeira, vēē-mā'ēē-rää: town; in the province of Estremadura, Portugal; near the coast; 7 miles N. of Torres-Vedras (see map of Spain and Portugal, ref. 16–A). It is noted for a battle which took place Aug. 21, 1808, between the French under Junot and the British under the Duke of Wellington, in which the French were defeated.

Vimeur, Donatien, de: See Rochambeau.

Vinalhaven: town (settled in 1765, incorporated in 1789); Knox co., Me.; comprising several islands in Penobscot Bay; 15 miles E. of Rockland (for location, see map of Maine, ref. 9–E). It contains valuable granite-quarries, 2 churches, high school, public library, and 2 hotels. Pop. (1880) 2,855; (1890) 2,617; (1900) 2,358.

Vincennes, Fr. pron. văń'sen': a commune (or township) of France; adjoining Paris on the E.; noted for its château and forest (Bois de Vincennes). The present château was begun by Philip de Valois (1333), and constitutes

a fortress, in form a parallelogram 1,200 by 670 feet. An interior fort, "the donjon," was flanked by nine towers, all of which except one were removed in 1818 in remodeling the work, it having become the chief arsenal of Paris. The château of Vincennes was, up to the time of Louis XI., a royal residence. Subsequently, it became a state prison. The list of prisoners contains some of the greatest names of France. The unfortunate Due d'Enghien (see ENGHIEN) was shot here in the moat at the southeast angle. The church (La Sainte Chapelle) where his remains are deposited contains a monument to his memory. There are extensive barracks and stables for cavalry; and, besides being a great arsenal, Vincennes comprises the shooting-school where officers from all regiments are sent to learn the use of modern arms, and to which the regiments of the garrison of Paris and environs send their contingents for practice both with artillery and small-arms. The Bois de Vincennes is a park, covering an area of nearly 4 sq. miles, that is much resorted to by the middle classes of Paris. Pop. (1891) 24,626.

Revised by M. W. HARRINGTON.

Vincennes, vin-senz': city; capital of Knox co., Ind.; on the Wabash river, and the Balt. and Ohio S. W., the Cleve., Cin., Chi. and St. L., the Evansv. and Terre Haute, and the Penn. railways; 51 miles N. of Evansville, and 150 miles E. of St. Louis (for location, see map of Indiana, ref. 9-B). It occupies a dry, level, and elevated plain; is surrounded by prairie-lands; and is laid out regularly in 300-foot squares, with streets nearly parallel and generally 50 feet wide. It contains Harrison Park, Court-house Square, and City-hall Plaza; and its notable public buildings include the Harrison house, erected by Gov. Harrison in 1804, St. Francis Xavier Cathedral, Knox County court-house (cost $400,000), city-hall (cost $100,000), 4 public high schools, and the buildings of Vincennes University. There are 16 churches and chapels, several public and denominational schools, 4 libraries, 3 national banks with combined capital of $300,000, St. Vincent's Orphan Asylum for Boys (Roman Catholic), an Orphan's Home, and a quarterly, a monthly, 4 weekly, and 2 daily periodicals. The city has an assessed valuation of $5,051,405; gas and electric-light plants, electric street-railway, water-works, 3 grist and 3 saw mills, 3 foundries and machine-shops, sewer-pipe works, brewery, and manufactories of wrapping-paper, brick, tile, plaster, cement, stoves, wagons, and a large variety of articles of iron, wood, and tin. Vincennes was founded in 1702 by French troops for a fort; was surrendered by the French to the British in 1763; by the British to Virginia troops in 1779; and was ceded to the U. S. by Virginia in 1783. It is the oldest settlement in Indiana, and, excepting Detroit and Kaskaskia, the oldest in the territory comprising the States of Ohio, Michigan, Illinois, Indiana, and Wisconsin. It was the capital of Indiana from 1800 to 1813. On the southeast side of the city and visible from any part of it are five of the most perfect specimens of the works of the mound-builders. Pop. (1880) 7,680; (1890) 8,853; (1900) 10,249.

HENRY S. CAUTHORN.

Vincennes, văn'sen', JEAN BAPTISTE BISSOT, Sieur de: explorer; b. in Quebec, Canada, in Jan., 1688; son of a wealthy merchant of Quebec; was a near relative of Joliet; took part from childhood in expeditions to the Western country; fought against the Iroquois at Mackinac in 1698; entered the army as ensign; resided long among the Miami Indians, with whom he was a great favorite; rescued some Iroquois prisoners from the Ottawas 1704; came in collision with La Mothe Cadillac, the commander at Detroit; rendered valuable services against the Foxes by saving Detroit 1712; built soon afterward a fort and trading-post on the site of the city of Vincennes, Ind., and in 1736 joined the expedition of d'Artaguette against the Chickasaws, by whom, after several victories, he was taken prisoner and burned alive, along with d'Artaguette, Père Senat, and several others.

Vincent, CHARLES EDWARD HOWARD, C. B.: member of Parliament; b. at Slinfold, Sussex, England, May 31, 1849; son of Rev. Sir Frederick Vincent; educated at Westminster School and the Royal Military College, Sandhurst; served in the army 1868–73; captain in the Royal Berks Militia 1873–75; lieutenant-colonel Central London Rangers 1875–78; appointed director of criminal investigations 1878; called to the bar 1876; special correspondent of *The Daily Telegraph* in Berlin 1871; military commissioner of *The Daily Telegraph* at the outbreak of the Russo-Turkish war in 1877; reorganized the detective system of the metropolitan police, 1878, and was given absolute control over the criminal investigations; resigned to enter Parliament 1884; appointed colonel commandant of the Queen's Westminster Volunteers; returned to Parliament as Conservative member for the central division of Sheffield 1885, 1886, and 1892; is identified with the fair trade movement, united empire trade, and British labor questions. Author of *Elementary Military Geography, Reconnoitring and Sketching* (1872); *Procédure d'Extradition* (1880); *A Police Code and Manual of Criminal Law*, and other works.

Vincent, Sir EDGAR, K. C. M. G.: financier; educated at Eton; was appointed in 1880 private secretary to Lord Edmund Fitzmaurice, commissioner for Eastern Roumelia, and in 1881 assistant to the commissioner for the evacuation of the territory ceded to Greece by Turkey; appointed representative of Great Britain, Belgium, and the Netherlands on the council of the Ottoman public debt held at Constantinople 1882, and financial adviser to the Egyptian Government 1883; subsequently governor of the Imperial Ottoman Bank. He restored the financial prosperity of Egypt and freed Turkey from financial embarrassment.

Vincent, FRANK: See the Appendix.

Vincent, JAMES EDMUND: See the Appendix.

Vincent, JOHN HEYL, S. T. D., LL. D.: bishop; b. at Tuscaloosa, Ala., Feb. 23, 1832; educated at the academies at Lewisburg and Milton, Pa., and Wesleyan Institute (Newark, N. J.); joined the New Jersey Conference in 1853; ordained deacon in the Methodist Episcopal Church in 1855 and elder in 1857; transferred to the Rock River Conference, Illinois, in 1857; held pastorates in Chicago, Galena, and elsewhere; and became distinguished by his efforts to improve the organization and literature of Sunday-schools. In 1866 he founded the *Sunday-school Teacher* at Chicago, Ill.; in 1868 was placed by the General Conference in the Sunday-school work of the Methodist Episcopal Church; with Lewis Miller, of Akron, O., established the Chautauqua Assembly, of which he is now chancellor. In 1888 he was elected bishop with official residence at Buffalo, N. Y.; in 1892 became a resident of Topeka, Kan. He is the author of *The Modern Sunday-School* (New York, 1887); *The Church School and its Officers* (New York, 1872); *The Chatauqua Movement* (Boston, 1886); *The Revival and After the Revival* (New York, 1883); *The Home Book* (New York, 1887); *Better Not* (New York, 1888); *Pedagogy* (New York, 1890); *Sunday-School Institute and Normal Classes* (New York, 1872); *Studies in Young Life* (New York, 1890; *To Old Bethlehem* (Meadville, 1890); *My Mother* (Meadville, 1892); *In Search of His Grave* (Meadville, 1893); *The Story of a Letter* (New York, 1893); *The Holy Waiting* (Cincinnati, 1893); *Earthly Footsteps of the Man of Galilee* (St. Louis, 1894); and numerous text-books for Sunday-schools and the literary work of the Chautauqua system.

Revised by A. OSBORN.

Vincent, MARVIN RICHARDSON, D. D.: minister and professor; b. at Poughkeepsie, N. Y., Sept. 11, 1834; educated at Columbia College; Professor of Latin in Troy University 1858–61; pastor of First Presbyterian church, Troy, N. Y., 1863–73; Church of the Covenant, New York, 1873–88; and since 1888 has been Professor of Sacred Literature in Union Theological Seminary. Dr. Vincent translated, with Prof. Charlton T. Lewis, Bengel's *Gnomon of the New Testament* (2 vols., Philadelphia, 1860), and has published *Amusement a Force in Christian Training* (1867); *The Two Prodigals* (New York, 1876); *Gates into the Psalm Country* (New York, 1878; new ed. 1893); *Stranger and Guest* (New York, 1879); *Faith and Character* (New York, 1880); *The Minister's Handbook* (New York, 1882); *In the Shadow of the Pyrenees* (New York, 1883); *God and Bread* (New York, 1884); *The Expositor in the Pulpit* (New York, 1884); *Christ as a Teacher* (New York, 1886); *The Covenant of Peace* (New York, 1887); *Word Studies in the New Testament* (3 vols., 1887–90); *Exegesis* (New York, 1891); *The Student's New Testament Handbook* (New York, 1893); *Bible Inspiration and Christ* (New York, 1895); and *That Monster—the Higher Critic* (New York, 1895).

C. K. HOYT.

Vincent, Cape: See CAPE VINCENT.

Vincent de Paul: See PAUL, ST. VINCENT, de.

Vincen'tians: a congregation of secular Roman Catholic priests not under a monastic rule, but under special obligations to preach and hear confession among the poor, to assist in the education of clerics, and to further the annual devotion called the "ecclesiastical retreat."

Vinci, Leonardo, da: See Leonardo da Vinci.

Vindictive Damages: See Damages, Measure of.

Vine, Sir John Richard Somers, C. M. G., F. S. S.: statistician; b. at Wells, Somerset, England, Dec. 10, 1847; educated at the Grammar School, Spalding, and at a private school in Cambridge; became a journalist; was private secretary at the Mansion House to the lord mayors of London 1871–75; city and official agent to the International Fisheries, Health, and Inventions Exhibitions 1883–85, and to the royal commissioners for the Colonial and Indian Exhibition 1886; knighted 1886; became assistant organizing secretary to the proposed Imperial Institute as the national memorial of the Queen's reign 1886, and for his services to that institution was created a Companion of the Most Distinguished Order of St. Michael and St. George. He is prominent as a Freemason, is a past grand deacon, and was founder and first elected master of the Savage Club Lodge. He has published a number of statistical works, including *English Municipal Institutions* (1878), and *The English Municipal Code* (1882), and was the projector of *The Imperial Institute Year-Book*, first issued in 1892.

Vine-culture: See Grape.

Vine Family, or **Grape Family**: the *Ampelideæ*; a small group (435 species) of choripetalous, dicotyledonous, woody plants, mostly climbing, with 4- or 5-merous flowers, stamens opposite the petals, ovary superior, of 2 to 6 carpels, as many cells, and few ovules. They are most numerous in the tropics; twenty species are natives of North America. Many species of *Vitis*, the Grape (*q. v.*), are grown for their delicious berries. The Virginia creeper (*Parthenocissus quinquefolia*, or *Ampelopsis quinquefolia*) of the U. S. and the Japanese creeper (*P. tricuspidata*) of Eastern Asia and Japan are well known ornamental climbers.

Charles E. Bessey.

Vinegar [M. Eng. *vinegre*, from O. Fr. *vinaigre*: Ital. *vinagro*: Provenç. *vinagre-s*: Span. *vinagre* < Lat. *vinum acre*, sour wine]: a dilute solution of Acetic Acid (*q. v.*), mixed with small quantities of sugar and other organic and vegetable matters, produced by the oxidation of alcoholic solutions. The oxidation is effected by an organism called *Mycoderma aceti*. Pasteur showed that this organism acts as the oxygen-carrier in the reaction. The tough gelatinous mass often found in the vessels used in the manufacture of vinegar, and known as mother-of-vinegar or vinegar-plant, is a distinct ferment, which, like the *Mycoderma aceti*, has the power to convert alcohol into vinegar. It can also cause other changes, as that of dextrose into cellulose. The formation of vinegar occurs more readily when, in addition to the presence of the *Mycoderma*, the following conditions prevail: The alcoholic fluid should be sufficiently dilute, not containing more than 12 per cent. of alcohol; the temperature should not be much below 70° F.; air (oxygen) should be supplied in abundance, and come into intimate contact with the solution to be acetified. During the oxidation of alcohol to acetic acid an increase of the temperature and specific gravity of the liquid occurs. In France and Germany the greater part of the vinegar is made from inferior grades of wine; in England infusions of malt and soured beers are extensively employed; while in the U. S. cider and alcoholic liquors are largely used.

Wine vinegar is manufactured in Paris by the following process: The wine is first mixed with wine-lees, and is then put into sacks, which are placed in a large vat and submitted to pressure from above. It is next introduced into large upright casks having an opening at the top, and allowed to acetify. The regulation of the temperature exerts an important influence upon the quality of the vinegar produced. In summer, when the casks are exposed to the heat of the sun, the oxidation is usually completed in two weeks, but in winter, when they are placed in a warmed chamber, a month's time is often required. The liquid is then run off into barrels containing shavings of birch-wood, in which it is allowed to remain for two weeks, when the vinegar will be clarified and ready for use. In Orléans, where the best vinegar is made, the casks used, which have a capacity of about 400 pints, are placed in rows, one over the other. The wine used is preserved in a vat containing beech-shavings, by which it is separated from the lees and clarified. About 100 pints of boiling vinegar is first introduced into each cask, where it is allowed to remain for several days, after which a small quantity (10 pints) of the wine is gradually added until the casks are filled, when they are allowed to remain at rest for fifteen days. Half of the vinegar is then drawn off and stored, and more wine is added to the remainder in the same manner as before. In this way the process is continued uninterruptedly, often for as much as ten years, at the end of which time, however, a sediment of yeast, argol, etc., accumulates, rendering a cleansing of the entire vessel necessary. Although in the above operation no extensive contact between the wine and air is apparent, a change of the surface of the fluid is constantly taking place, owing to the greater density of the vinegar formed; a continuous circulation of air is also produced, as the air from which the oxygen has been absorbed acquires a lower specific gravity, and therefore rises upward through the casks. Usually, wines a year old furnish the best vinegar; those of a greater age, which have lost their extractive matter, are not suitable for use. Vinegar prepared from wine is either white or red according to the color of the wine from which it is made. It contains, in addition to acetic acid and water, small quantities of acetic ether, potassium bitartrate, and aldehyde; its specific gravity ranges from 1·014 to 1·022. The process just described is termed the *old method*; it is also occasionally used in the manufacture of vinegar from malt. *The quick* or *German process* (*Schnellessigbereitung*), which is based upon the older method of Boerhaave (1720), and was first introduced by Schützenbach in 1823, effects the oxidation of the alcohol to acetic acid in the most rapid and complete manner possible by bringing an enlarged surface of the liquid into intimate contact with the air. This is accomplished by causing the alcoholic liquor to fall in drops and meet an ascending current of air. The vessel employed consists of a large vat about 8 feet in height, and having a diameter of 3½ feet at the top and 3 feet at the bottom. About a foot from the real lower bottom it contains a false bottom, similar to a sieve in construction, which supports a layer of beech-shavings extending nearly to the top of the vat. Between the true and false bottoms a row of air-holes half an inch in diameter is bored in a slanting direction from the outside downward. The beech-shavings are first boiled in water and dried; they are then "soured," or allowed to soak in warm vinegar for twenty-four hours, with which they become impregnated. The vinegar employed to acetify the shavings should not contain any mineral acid; it should also be free from essential oils and pyroligneous acid, the presence of which greatly retards acetification. At a short distance (8 inches) from the top of the vat a perforated wooden disk is fitted in, the perforations of which have about the diameter of a goose-quill (⅙ inch); this also has several larger orifices inclosing glass tubes which permit the escape of the air from below. The space about the disk is filled with cotton batting or yarn, which becomes swollen and penetrates through the holes for a short distance, thus causing the liquid to trickle slowly upon the shavings. At the top of the vat is a close-fitting wooden lid, having in its center a circular hole through which the liquid is introduced. During the oxidation of the alcoholic liquid a large amount of heat is developed in the interior of the cask, whereby the air is made to ascend, and fresh air to enter at the lower air-holes, a constant circulation being produced. After the shavings have been "soured," the liquid to be converted into vinegar—usually diluted spirits—is poured into one vat, and, as it flows off, is introduced into a second. If not over 4 per cent. of alcohol is contained in the original liquid, that drawn off from the second vat will be converted into good vinegar. The vinegar, as it collects between the true and false bottoms of the vat, is removed by a tap, which is so constructed that its end dips in the lower stratum of the liquid (that is, in the strong vinegar), and has its exterior end raised so that the liquid can not flow out until quite a layer has accumulated, the presence of which assists in the process of acetification by evolving acid vapors, which ascend to the upper part of the vat. The temperature of the vinegar-room should be from 75° to 85° F., that of the vat from 95° to 100° F. Occasionally, a layer of white sand is introduced just above the lower false bottom, which is then covered with a flannel cloth to prevent the holes from becoming obstructed. This arrangement assists in the clarification of the vinegar. The composition of the liquid to be acetified varies greatly. The following mixtures are frequently used: (1) 60-per-cent. whisky, 50 gal., beer or malt wort, 37 gal. (also employed to sour the beech-shavings); (2) common whisky, 3 gal., prepared vinegar, 4 gal., pure water, 33 gal.; (3) brandy, 20 parts, vinegar, 40 parts, water, 120 parts; to which an infusion of a mixture of

bran and rye meal is first added in order to promote the formation of the *Mycoderma aceti*. It is usual to draw off 4 gal. of the vinegar every hour, the same quantity of one of the above mixtures being added, together with an additional quart to compensate for the waste in manufacture. The prepared vinegar is preserved in a large vat to which half a gallon of molasses is added every day, until a layer having a thickness of 2 to 3 inches is formed; in this way a fine color is imparted to the product. Owing to the development of heat in the vats, a loss of alcohol, aldehyde, and acetic acid by evaporation occurs in the above process, frequently amounting to 10 per cent. This objection is remedied in Singer's generator, which consists of a number of vessels, one placed above the other, connected by wooden tubes, through which the liquid slowly trickles from one vessel into the other, a longitudinal slit being cut in each tube, thus permitting a free circulation of the air. The quick method of vinegar-making has largely superseded all others, and is in general use in the U. S.

Malt vinegar, which is the variety chiefly used in Great Britain, is generally prepared by submitting the wort obtained by mashing malt or a mixture of malt and barley to vinous fermentation, and oxidizing the resulting alcoholic liquor. This latter process can be effected as in the preparation of wine vinegar, or by repeatedly passing the liquid through vats containing beech-shavings, as in the quick process. Singer's generator is also often employed. Dilute solutions of sugar, and even mixtures of starch with yeast, furnish good vinegar. A good article for domestic use can be made by adding $\frac{1}{4}$ pint of yeast to a solution of $1\frac{1}{4}$ lb. of sugar in 1 gal. of water, allowing the mixture to stand for three days at a temperature of 80° F., then drawing off into a ripening-cask, and adding 1 oz. of bruised raisins and 1 oz. of crude tartar. Malt vinegar possesses a yellowish-red color and an aromatic odor, which is imparted to it by the acetic and other ethers present. It is sold of four degrees of strength, known in the trade as Nos. 18, 20, 22, and 24. The last, which is the strongest and contains 5 per cent. of real acetic acid, is called *proof vinegar*; its sp. gr. is 1·019. The putrefactive fermentation of vinegar was formerly thought to be prevented by sulphuric acid, the addition of $\frac{1}{1000}$ part of which is allowed by law in England; but this is now known to be unnecessary, and the practice has been discontinued.

Cider vinegar, if made from good, sweet, and ripe apples, is perhaps the most agreeable variety in use; it is met with chiefly in the U. S. In its preparation fresh cider is allowed to ferment in barrels having the bungholes open, and exposed either to the heat of the sun or to that of a warm cellar. It is well to allow several separate fermentations to take place, fresh quantities of cider being added to the barrels every two weeks; the acetification of the cider is also greatly accelerated by the addition of mother-of-vinegar. Cider vinegar contains, in addition to acetic acid, varying proportions of acetic ether and malic acid.

Pasteur has suggested a process of vinegar-making by the direct acid of the *Mycoderma aceti*. This fungus is first propagated in an aqueous solution containing 2 per cent. of alcohol, 1 per cent. of vinegar, and small amounts of potassium, calcium, and magnesium phosphates. The plant soon spreads out, and ultimately covers the entire surface, the oxidation of the alcohol being at the same time gradually effected. When one-half of the alcohol has been acetified, small quantities of wine or alcohol, mixed with beer, are daily added, the complete conversion of the alcohol into vinegar being allowed to take place as soon as the acetification becomes weaker. The vinegar formed is then drawn off, and the plant again used in the same apparatus. The vessels employed are circular or rectangular shallow wooden tanks, into which the air is allowed access by means of two small apertures at the side, and are covered with lids. The alcoholic liquid is introduced through two gutta-percha tubes, which connect with the vessels at their bottoms. Wine or malt liquors can be directly converted into vinegar by this process; but when only alcohol is used, the addition of ammonium sulphate and potassium and magnesium phosphates and a little vinegar is necessary in order to furnish the organic and inorganic food needful for the vinegar-plant.

A vinegar-making process in which the oxidation of the alcohol is effected with the aid of finely divided platinum was first proposed by Döbereiner. Several shelves are arranged in a tall glass case, and on them are placed a number of porcelain capsules containing alcohol. Directly over each capsule is a tray supported on a tripod, containing a little platinum black or spongy platinum. At the top and bottom of the case ventilators are so constructed that the access of air can be easily regulated. Upon heating the apparatus, by placing it in the sunshine or by means of a steam-pipe, to about 85° F., the alcohol is slowly evaporated, and on coming in contact with the platinum is oxidized to acetic acid. So long as the ventilation is maintained, the platinum retains its property of conveying oxygen to the alcohol; when the acetification is completed, fresh air is admitted and the process begun again. The vapors of alcohol and acetic acid carried off by the outgoing current of air can be collected by a condensing apparatus. Vinegar prepared from pure alcohol does not possess the pleasant flavor of that obtained from wine and cider, but the addition of a little acetic ether renders it more agreeable in taste. Small quantities of fusel oil, oil of cloves, or butyric ether are also occasionally added to the alcohol to be acetified in order to impart a fine aroma.

In countries where a high duty on alcoholic liquids exists, table vinegar is frequently prepared from wood-vinegar or pyroligneous acid. For this purpose the crude acid is carefully purified, either by conversion into sodium acetate and distillation with sulphuric acid, or by saturation with lime, then adding hydrochloric acid, removing the tarry matters separated, and distilling. It is afterward further deodorized and purified by distillation with potassium dichromate and filtration through animal charcoal. Small quantities of acetic ether and burned sugar are often used to impart flavor and color.

Distilled vinegar, which is generally employed for pharmaceutical purposes, is weaker than ordinary vinegar, since the boiling-point of concentrated acetic acid is above that of water. It is often contaminated with small quantities of alcohol, aldehyde, and empyreumatic substances.

The quantity of acetic acid in vinegar differs greatly. The specific gravity is not an accurate indication of the strength, owing to the presence of foreign bodies. A preferable method consists in determining the amount of a standardized alkaline solution necessary to saturate the acetic acid present. (See ANALYSIS, VOLUMETRIC.) The results given by this test are, however, not absolutely correct, as neutral alkaline acetates possess an alkaline reaction. The vinegar can also be supersaturated with a baryta water, the excess of the salt eliminated by a current of carbon dioxide, and the barium salt in the filtrate precipitated as sulphate, from which the amount of acetic acid is calculated by multiplying by 0·515. Sulphuric acid, added to increase the acidity of vinegar or for other purposes, is best detected by boiling the suspected vinegar with a small quantity of potato-starch, and, after the *complete cooling*, adding a solution of iodine; if the vinegar be pure, the blue color of iodide of starch will become apparent; but if sulphuric (or hydrochloric) acid be present, the starch will be converted into dextrine by the boiling, and the blue coloration will fail to appear. Free sulphuric acid can also be detected by means of calcium chloride, which causes a precipitation of calcium sulphate in presence of the free acid, but not in that of the minute quantities of sulphates generally present. Hydrochloric acid is indicated by a white precipitate with silver nitrate; nitric acid can be detected by a yellow color when the vinegar is boiled with indigo, or by the deflagration of the residue obtained by evaporating with a little sodium carbonate. Such acrid substances as red pepper, mustard, etc., are recognized by evaporating the vinegar to an extract, which if they are present will possess a biting taste. Copper is detected by the formation of a brown precipitate upon addition of potassium ferrocyanide; lead, by the black precipitate produced by hydrogen sulphide, and the yellow one given by potassium iodide.

Revised by IRA REMSEN.

Vinegar Eels: See ANGUILLULA.

Vinegar-plant: See VINEGAR.

Vineland: borough; Landis township, Cumberland co., N. J.; on the Cent. of N. J. and the W. Jersey railways; 12 miles E. of Bridgton, 34 miles S. E. of Philadelphia (for location, see map of New Jersey, ref. 7–B). The borough comprises only the central part of the township, which is 1 mile square, and was founded in 1861 by Charles K. Landis. It is laid out with principal avenues 100 feet wide, and others 66 feet; has 15 churches, a central high school (building cost over $35,000), several public and private schools, and a kindergarten, a public library, a national

bank with capital of $50,000, a State bank with capital of $28,900, and 2 daily, 3 weekly, and 2 monthly periodicals; and is principally engaged in the cultivation of small fruits, and the manufacture of machinery, flour, lumber, shoes, gloves, buttons, carriages, clothing, paper boxes, plows, linoleum, Smyrna rugs, and chenille curtains. Pop. (1880) 2,519; (1890) 3,822; (1900) 4,370.

EDITOR OF "EVENING JOURNAL."

Viner, CHARLES: law-book writer; b. about 1680. He was the author of *A General Abridgment of Law and Equity, Alphabetically Digested under Proper Titles*, upon which he labored for more than fifty years, having it printed in his own house on paper manufactured for the purpose. The work was based upon Rolle's *Abridgment*. It contains almost everything of value in the previous abridgments of the law of England, or in the printed reports, besides considerable from MS. reports. The work is chiefly valuable by reason of its fullness, being of little weight in itself, as it is inaccurate in its citations and cumbersome and irregular in its execution. The work was first published in twenty-four volumes (1741–51), and later a reprint was issued (1792–94), followed by a supplement of six volumes by various authors (1799–1806). He bequeathed £12,000 to endow fellowships and scholarships, and to establish a professorship of common law at Oxford University. The first incumbent of the professorship was Sir William Blackstone (1758), who was followed by others much less prominent, including Robert Chambers (1760), Richard Woodesson (1777), and James Blackstone (1793). D. at Aldershot, Hampshire, June 5, 1756.

F. STURGES ALLEN.

Vine-rapes: the *Cytinaceæ*; a small family (twenty-seven species) of herbaceous, parasitic dicotyledons, probably related to the myrtles (*Myrtaceæ*) and evening primroses (*Onagraceæ*), but so much degraded and modified that their true relationship is greatly obscured. They have an inferior, one-celled, pluricarpellary ovary containing innumerable, minute ovules; stamens eight to many; perianth simple and fleshy. The stems and leaves are usually much reduced, the flowers often appearing to be sessile upon the host. The vine-rapes are natives of the warm regions of both hemispheres. The most remarkable is the giant vine-rape (*Rafflesia arnoldi*, see figure) of Sumatra, whose expanded flower is nearly 40 inches in diameter, with five red-mottled petals. It is parasitic upon a woody climbing plant (*Cissus angustifolium*), a near relative of the grape. See RAFFLESIA.

Giant vine-rape (*Rafflesia arnoldi*).

CHARLES E. BESSEY.

Vines, RICHARD: colonist; b. near Bideford, Devonshire, England, about 1585; received a medical education; was sent by Sir Ferdinando Gorges in 1614 or 1616 to act as his agent in planting a settlement on Saco Bay, Me.; spent there the winter of 1616–17, during the great pestilence which decimated the New England Indians; gave them medical assistance; ascended the Saco river in a canoe to Crawford's Notch 1617; was the first white man who visited and described the White Mountains; received from the council of the Plymouth Company in 1630 a grant of land on the Saco river, where, with John Oldham, he founded the towns of Biddeford and Saco. He was the principal superintendent of the plantation until 1645; was then made deputy-governor, but resigned the same year; returned to England, but soon settled in Barbados as a planter and physician. D. in Barbados, Apr. 19, 1651.

Vines, SYDNEY HOWARD, F. R. S.: botanist; b. in London, England, Dec. 31, 1849; educated privately; began the study of medicine at Guy's Hospital 1869; graduated at Cambridge 1876, and became a fellow of and lecturer at Christ's College; took the degree of D. Sc. at Cambridge 1884, having been elected reader in botany in the same year; became a fellow of Magdalen College, Oxford, and Sherardian Professor of Botany 1888; aided in founding the *Annals of Botany*, of which he is an editor, and has published *Lectures on the Physiology of Plants* (Cambridge, 1886).

Vinet, vē'nā', ALEXANDRE RODOLPHE: theologian; b. at Ouchy, canton of Vaud, Switzerland, June 17, 1797; studied at Lausanne; was appointed Professor of the French Language and Literature in the Gymnasium of Basel 1817, whence he went in the same capacity to the University of Basel 1835; was made Professor of Practical Theology at Lausanne in 1837. In 1819 he had been ordained, and he took an increasing interest in ecclesiastical politics. His opposition to state interference at last led him to the decisive step of leaving the clergy of the national church in the Vaud canton (1840) and becoming a layman. In 1845 he joined the Free Church of Vaud, which had just been formed, and resigned his theological professorship. He was, however, immediately appointed Professor of French Literature in the Lausanne Academy. The next year (1846) the radical party compelled his resignation. He is known to theological students by his excellent works on homiletics (Eng. trans. 1853) and pastoral theology (Eng. trans. 1852), but to a much wider circle as a brilliant, learned, and judicious critic of French literature. There are translations of his *History of French Literature in the Eighteenth Century* (1854) and *Studies in Pascal* (1859). D. at Clarens, on the Lake of Geneva, May 4, 1847. See his *Life* by Laura M. Lane (Edinburgh, 1890). Revised by S. M. JACKSON.

Vineur, JEAN BAPTISTE DONATIEN: See ROCHAMBEAU.

Vineyard Sound: the passage between Martha's Vineyard and the Elizabeth islands, on the south coast of Massachusetts. It is 20 miles long and 6 broad, and is a great thoroughfare for coasting vessels.

Vinland [Icel. *vīn*, wine + *land*, land]: that part of the coast of North America which was visited by the Norsemen in the year 1000. Bjarne Herjulfson saw this country in 986, when he was on his way to Greenland, but did not land. Fourteen years later LEIF ERIKSON (*q. v.*) made an expedition thither, and on account of the abundance of grapes growing there he named the country Vinland. The oldest evidence of the discovery of Vinland is that given by ADAM OF BREMEN (*q. v.*) in his book *On the History of the Bremen Church and on the Geography of the Countries of the North*. He enumerates the islands of the sea N. and W. of Norway, and among them he mentions Greenland and Vinland. Iceland's oldest historian, Are or Ari (see ARI THE WISE), who wrote about 1120–30, speaks of the discovery of Vinland, and he got his information from his uncle, Thorkel Gelleson, at Helgafell, who in his youth, 1060–70, had lived in Greenland, and had there gathered knowledge of the discoveries, partly from an old man who had himself accompanied Erik the Red from Iceland in 986, and thus had witnessed Leif Erikson's return from Vinland. From Are the Wise, directly or indirectly, are derived all the later accounts of the discovery of Vinland, found in manuscripts of the thirteenth, fourteenth, and fifteenth centuries. The principal sources of information in regard to the discovery and settlement of Vinland are found in two noted collections of manuscripts, viz., the *Flateyarbók* and the *Hauksbók*. The *Flateyarbók* was secured by Bishop Brynjulf Sveinson from a peasant on Flatey, an island on the west coast of Iceland. It was put in writing in the latter part of the fourteenth century by the priests Jón Thordson and Magn. Thorhallson. A photographic facsimile of this interesting work has recently been published in Copenhagen. In the *Hauksbók* there is an account of the discovery of Vinland under the heading *Thorfin Karlsefni's Saga*, but the correct old name of this is the *Saga of Erik the Red*. This story of the Vinland voyages dates from the second half of the thirteenth century—that is to say, from the golden period of the saga age.

The countries visited by Leif Erikson were called by him Helluland, Markland, and Vinland. The description of Helluland applies to Newfoundland, that of Markland to Nova Scotia, and that of Vinland to New England. Leif Erikson came to Vinland by sailing on in a southwestern direction from Markland. Prof. G. Storm has attempted to show that Helluland, Markland, and Vinland are to be identified as Labrador, Newfoundland, and Nova Scotia; but this is impossible, since Nova Scotia has never been known to produce wild grapes. Taking all things into considera-

tion—the circumstances of the voyages, the course of the winds, the direction of the currents, the time spent between each sight of land, the description of the different lands and their products—all point to New England as the site of Vinland. And if some spot on the New England coast should be given a preference, the basin of the Charles river should be selected as the most probable scene of the visits of Leif Erikson, Thorvald Erikson, and Thorfin Karlsefni in the tenth and eleventh centuries. (See NORUMBEGA.) The accounts given of the natives, of the corn, grapes, and fish, all apply to this locality.

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Vinnit'za: a district-town of the Russian government of Podolia; on the Bug; 120 miles S. W. of Kiev (see map of Russia, ref. 9–C). It has a gymnasium, distilleries, and a large trade in grain. Pop. (1888) 23,441.

Vinton: city; capital of Benton co., Ia.; on the Red Cedar river, and the Burl., Ced. Rapids and N. Railway; 25 miles N. of Cedar Rapids, 31 miles S. S. E. of Waterloo (for location, see map of Iowa, ref. 5–I). It is in an agricultural region, is the site of the Iowa College for the Blind, and the Tilford Collegiate Academy, and has 3 churches, 2 large public-school buildings, a State bank with capital of $65,000, a loan and trust company with capital of $65,000, a private bank, and a semi-weekly, a semi-monthly, and 3 weekly periodicals. There are several flour-mills, mineral paint-works, corrugated steel-works, and a creamery. Pop. (1880) 2,906; (1890) 2,865; (1900) 3,499.

EDITOR OF "EAGLE."

Vinton, ALEXANDER HAMILTON, M. D., S. T. D.: clergyman; b. at Providence, R. I., May 2, 1807; studied at Brown University; graduated at the Yale Medical School 1828; practiced as a physician in Pomfret 1828–32; pursued a theological course in the Protestant Episcopal Seminary at New York; was ordained priest 1836; became prominent as a leader of the Low Church party; was pastor of churches at Portland, Me., 1835–36, Providence, R. I., 1836–42, Boston, Mass., 1842–58, Philadelphia, Pa., 1858–61, New York 1861–70, Boston 1869–77. He published a volume of *Sermons* (1855). D. in Philadelphia, Apr. 26, 1881.

Vinton, DAVID HAMMOND: soldier: b. at Providence, R. I., May 4, 1803; graduated at the U. S. Military Academy in 1822, and entered the Fourth Artillery; transferred to the infantry in 1823. After a term of garrison and special duty, he was sent to Florida in 1836, where employed on quartermaster duty, and in 1837 made quartermaster-general of Florida. He remained in the same service until 1846, when he was made chief quartermaster on the staff of Gen. Wool, with rank of major, serving with him in Mexico; was chief quartermaster of the department of the West 1852–56, of the department of Texas 1857–61, and was taken prisoner upon the surrender of Twiggs. Exchanged soon after, he was in Aug., 1861, made deputy quartermaster-general, and as chief quartermaster at New York during the civil war rendered valuable service. Promoted to be colonel of volunteers in 1864, in 1866 he became assistant quartermaster-general and colonel on the staff, and the same year was placed on the retired list. For faithful and meritorious services he was breveted colonel, brigadier-general, and major-general. D. at Stamford, Conn., Feb. 21, 1873. Revised by JAMES MERCUR.

Vinton, FRANCIS, S. T. D., D. C. L.: clergyman; brother of Gen. David H. Vinton; b. at Providence, R. I., Aug. 29, 1809; graduated at West Point 1830; became second lieutenant of artillery; was stationed at Fort Snelling, Minn.; at Fort Independence, Boston harbor, during which time he studied law at Harvard Law School; acted as civil engineer to several railroads; was admitted to the bar at Portsmouth, N. H., 1834; served in the war with the Creek Indians in Alabama and Georgia 1836; left the army in that year; studied in the General Theological Seminary, New York; was ordained priest 1839; was successively rector of churches at Providence and Newport, R. I. (1840–44), and Brooklyn, N. Y. (1844–56); declined the bishopric of Indiana 1847; became assistant minister of Trinity church, New York, 1855, and Professor of Ecclesiastical Law and Polity at the General Theological Seminary 1869. D. in Brooklyn, Sept. 29, 1872. He was the author of *Arthur Tremaine, or Annals of Cadet Life* (New York, 1830); *Lectures on the Evidences of Christianity* (New York, 1865); and a *Manual Commentary on the General Canon Law of the Protestant Episcopal Church in the United States* (New York, 1870), and various pamphlets.

Vinton, FREDERIC PORTER: portrait-painter; b. in Bangor, Me., Jan. 29, 1846; pupil of Bonnat and Jean Paul Laurens, Paris; became member of the Society of American Artists 1880; National Academician 1891; received honorable mention at the Paris Salon of 1890. His portraits are notable for their life-like aspect and vigorous drawing and modeling. His studio is in Boston. W. A. C.

Vio, THOMAS, de: See CAJETAN.

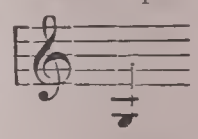
Vi'ola, or **Tenor Violin**: a very large violin, having four strings, two of catgut alone and two wound with wire; it stands an octave above the violoncello, and is employed almost exclusively for playing the middle part in orchestral music. The earlier composers about the time of Gluck made but little use of this instrument, except to strengthen the basses by doubling it in unison or the octave. Modern composers demand from it an independent agility equal to that of the violins. Its tone has a distiuct character of melancholy as compared with that of other stringed instruments. Revised by DUDLEY BUCK.

Violet: any species of *Viola*, a genus of dicotyledonous herbs, having irregular flowers, consisting of five sepals, five petals (the lower one spurred), five stamens, and a single tricarpellary pistil, having three parietal placentæ. About a hundred species are known, of which sixty are natives of north temperate countries, thirty of the mountainous regions of South America, two of Africa, and eight of Australia and New Zealand. There are from thirty to forty species in the U. S. The pansy (*V. tricolor*) and sweet violet (*V. odorata*), both from Europe, are common in cultivation.

CHARLES E. BESSEY.

Violet Family [*violet* is from O. Fr. *violette*, dimin. of *viole* < Lat. *vi'ola*, violet; cf. Gr. ἴον, for *Ϝίον, violet]: the *Violaceæ*; a small group (270 species) of choripetalous, dicotyledonous herbs and shrubs, which are widely distributed in all climates. The flowers are usually hermaphrodite and irregular, with pentamerous calyx, corolla, and andrœcium, the last with connivent or connate anthers; ovary superior, tricarpellary, with parietal placentæ and many ovules. The best-known representatives of the family are the species of *Viola*, the VIOLET (*q. v.*), of which thirty-three are natives of North America. An emetic and laxative principle in these plants has given some value to the root of a Brazilian shrub (*Ionidium ipecacuanha*), known in pharmacy as white ipecacuanha. C. E. B.

Violin [from Ital. *violino*, deriv. of *viola*, violin: O. Fr. *viele* > Fr. *viole*. The word is of Teutonic origin; cf. M. H. Germ. *videle* > Mod. Germ. *fiedel*: O. Eng. *fiðele* > Eng. *fiddle*. Other authorities derive the Romance words from a Lat. **vitula*, deriv. of *vītulā'ri*, celebrate a festival]: a musical instrument with four strings, played with a bow. It consists of three parts—the neck, the table, and the sounding-board; has at its side two S-shaped apertures of unequal size. Above these is a bridge, over which pass the strings from the lower extremity or tail-piece to the neck, where they are tightened or loosened by means of turning-pins. The violin is tuned in fifths, E–A–D–G, the lowest string (wound with wire) giving this tone:



It is considered the most perfect of musical instruments, on account of its capabilities of fine tone and expression, and forms with its cognates, the viola, violoncello, and double-bass or bass-viol, the main element of all orchestras. It is of considerable antiquity, being traced in England to the twelfth century. The most prized instruments are those made in the seventeenth and eighteenth centuries in Italy by the Amatis at Brescia, Stradivari and the Guarneris at Cremona, and Stainer in the Tyrol. Revised by D. BUCK.

Violle, vēē'ōl', JULES: physicist; b. at Langres, France, in 1841. He was educated in the École Normale Supérieure in Paris; received the degree D. Sc. in 1870; was appointed Professor of Physics at Lyons in 1883, at the École Normale in 1890, and in the Conservatory of Arts and Trades in Paris in 1891. Violle is chiefly known through his extended researches upon the laws of radiation and upon the measurement of high temperatures, including that of the sun; upon which subjects, as well as in other departments

of physics, he has published numerous papers. He is the inventor of the absolute standard of light adopted by the second Paris congress of electricians. The first volume of *Cours de Physique* was published in 1881, and later parts have appeared at intervals since then. E. L. NICHOLS.

Viollet-le-Duc, vēē'ō'lā'le-dük', EUGÈNE EMMANUEL: architect and writer on art; b. in Paris, Jan. 27, 1814. He became early a remarkable draughtsman of architecture and ornament. From 1836 to 1840 he traveled a great deal in France, Italy, and Sicily. In 1840, when the Sainte Chapelle in Paris was being restored under the direction of Félix Duban, he was made an inspector of the work, and as at this time the mediæval buildings of France were exciting a great deal of attention, he was employed for the care and restoration of the abbey church of Vézelay, the Cathedral of Carcassone, Notre Dame of Paris, and the abbey church of St. Denis, and later the ancient walls of Carcassone, the synodal hall at Sens, the Cathedral of Châlon, and the castle at Pierrefonds. Besides these important buildings he restored wholly or in part a number of smaller structures. He built a few buildings of his own design, but they have had no great reputation. About 1850 he began the extraordinary series of books and minor writings on architecture and decorative art which are so widely known. He had become extremely well versed in the theory of building and scientific construction, and his responsible task of restoring ancient buildings had taught him how even in minute details the builders had proceeded. He had a ready and fluent style, and his writings often suffer from excessive length; nevertheless his descriptions and explanations are models of clearness. His extraordinary gift as a draughtsman added much to the value of his books. No artist has ever been known who was his equal in making intelligible drawings explanatory of construction and design, and it is known that he made these with extraordinary rapidity. At the breaking out of the war of 1870 he became lieutenant-colonel of a volunteer regiment of engineers, serving in the defense of Paris. He was actively employed to the end of his life, and died at Lausanne, Switzerland, Sept. 17, 1879. His most important books are *Dictionnaire raisonné de l'architecture française du XIe au XVIe siècle* (Paris, 1854–69, 10 vols.); *Dictionnaire du mobilier français de l'époque carlovingienne à la Renaissance* (1855); *Entretiens sur l'architecture* (1858–68, 2 vols.); *Histoire d'une maison* (1873); *Histoire d'une forteresse* (1874); *Histoire d'un Hôtel-de-ville et d'une cathédral*; *Histoire d'un Dessinateur*. RUSSELL STURGIS.

Violoncel'lo: a bass violin with four strings tuned in fifths, A, D, G, and C, the two last strings being wound with wire.

Vioménil, vēē'ō'mā'neel', ANTOINE CHARLES DU HOUX, Baron de: soldier; b. at Fauconcourt, Vosges, France, Nov. 30, 1728; entered the army and served in Holland, Hanover, and Corsica, gaining the rank of field-marshal; was sent to Poland, where he aided the confederation of Bar against Russia 1770, and captured the castle of Cracow; went to the U. S. in 1780 as second in command to Count Rochambeau; distinguished himself at the siege and capture of Yorktown 1781, where he led his troops in the storming of the redoubt; was promoted to a lieutenant-generalship; returned to France and became governor of La Rochelle 1782; was so severely wounded while defending the king during the assault upon the Tuileries, Aug. 10, that he died a few weeks later in Paris, Nov. 9, 1792.—His brother, CHARLES JOSEPH HYACINTHE DU HOUX, Marquis de Vioménil, b. at Ruppes, Vosges, France, Aug. 22, 1734, served in Germany during the Seven Years' war; was a major-general under Rochambeau in the U. S. 1780–82, bearing the title of baron; was at Yorktown; was governor of Martinique 1789–90; emigrated from France as a royalist 1791; served under the Prince of Condé 1792–97; afterward held military commands in Russia and Portugal; became a peer 1814, a marshal of France July 3, 1816, and a marquis 1817. D. in Paris, Mar. 5, 1827.

Vionville: See MARS LA TOUR.

Viper: See VIPERIDÆ.

Viper'idæ [Mod. Lat., named from *Vipera*, the typical genus, from Lat. *vī'pera*, viper]: a family of poisonous snakes embracing the viper of Europe and related species. The form is typified by the common viper; the scales on the back and sides are oblong and imbricated, those on the abdomen transverse scutellæ; the eyes have, mostly, elliptical pupils; no lachrymal fossæ are developed; the poison-fangs are destitute of external grooves. The family includes a number of poisonous serpents peculiar to the Old World, and is at first sight distinguishable from the *Crotalidæ* (rattlesnakes, etc.) by the want of the deep pits between the eyes and nostrils which so much enhance the vicious look of the latter. The most notable species are the viper of Europe (*Vipera berus*), the cobra de capello (*Naja tripudians*), and the Egyptian *Naja haje* and *Cerastes hasselquistii*, or *ægyptica*, each of which has been supposed by different writers to have been the asp fatal to Cleopatra.

Revised by F. A. LUCAS.

Vique: See VICH.

Virchow, veer'chō, RUDOLF, M. D.: pathologist; b. at Schivelbein, Pomerania, Oct. 13, 1821; graduated M. D., University of Berlin, in 1843; in 1844 was Froriep's assistant at Charité Hospital, in 1846 was prosector, and in 1847 a lecturer at the university. In 1847 he established the *Archiv für pathologische Anatomie und Physiologie*, of which he is still editor (1895); was sent in 1848 by the Prussian Government to Silesia to investigate a typhoid fever raging there; was dismissed from Berlin University in 1849 for political reasons; was Professor of Pathological Anatomy at the University of Würzburg 1849–56; in 1852 was sent by the Bavarian Government to the Spessart to investigate a famine fever which had broken out there; returned to the University of Berlin in 1856, and acted as director of the hospitals during the campaigns of 1866 and 1870–71, taking part all the while with great energy in the political movements as a representative of the city of Berlin in the Prussian house of representatives. He is the creator of the cellular theory in pathology, which he has developed in *Die Cellularpathologie in ihrer Begründung auf physiologische und pathologische Gewebelehre* (1858). This is a biological principle establishing the fact that the laws working in disease are not different from those in operation in health, but that they are subject to different conditions. He also wrote *Handbuch der speciellen Pathologie und Therapie* (3 vols., 1854–62) and *Vorlesungen über Pathologie* (4 vols., 1862–67), besides a great number of minor essays on various subjects, among which are *Goethe als Naturforscher* (1861); *Ueber Pfahlbauten und Hünengräber* (1866); *Ueber Erziehung des Weibes für seinen Beruf* (1865); and *Die altnordischen Schädel zu Kopenhagen* (1871). He has been one of the most earnest advocates in Germany of sanitary reform and has done an immense amount of work to attain it. For more than twenty years he has been one of the aldermen of Berlin, and his liberalism in politics has exercised a potent influence in practical municipal work.

Revised by S. T. ARMSTRONG.

Virden: city; Macoupin co., Ill.; on the Chi. and Alton and the Jack., Louisv. and St. L. railways; 21 miles S. W. of Springfield, 31 miles E. S. E. of Jacksonville (for location, see map of Illinois, ref. 8–D). It is in a coal-mining region, and contains a high school, 2 private banks, 2 weekly newspapers, brick, and tile works, and poultry-packing house. Large quantities of grain are here shipped. Pop. (1880) 1,608; (1890) 1,610; (1900) 2,280.

Vireon'idæ [Mod. Lat., named from Lat. *vī'reo*, a kind of bird, perhaps the greenfinch; cf. *vire're*, be green]: a family of *Passeres* related to the shrikes. The bill is much compressed, decurved at the end and notched. The nostrils are lateral and overhung by membrane; the frontal feathers are bristly and erect, or bent slightly forward; the wings have mostly ten primaries, but the spurious one is wanting in certain Vireos; the tarsi have the lateral plates undivided, except at the extreme lower ends, and they are longer than the middle toes with the claws; the three anterior toes are extensively attached to one another. The family is peculiar to America, and comprises about fifty species of small singing birds. For the nest of the solitary vireo, see NESTS OF BIRDS. F. A. LUCAS.

Virgil: another spelling of VERGIL (*q. v.*).

Virgil'ia: a genus of South African leguminous trees, to which the American yellow-wood (*V. lutea*) was referred by Michaux, but Rafinesque named it *Cladrastis tinctoria*, the name by which it is usually known. It is a beautiful tree, about 40 feet in height, with flowers in loose pendent racemes 20 inches long; is much prized for lawn-planting, and is hardy and easily grown from the seed. L. H. B.

Virgin'ia [for Lat. *Virgī'nea* (sc. *cī'vitas*, state), liter., fem. of *virgī'neus*, of or belonging to a virgin, deriv. of

vir'go, vir'ginis, maiden, virgin. Named in honor of Elizabeth, the virgin queen]: one of the U. S. of North America (South Atlantic group); the tenth of the thirteen original States that ratified the Federal Constitution; popularly known as the Old Dominion State and as the Mother of Presidents.

Location and Area.—Virginia lies between 36° 31′ and 39° 27′ N. lat., and between 75° 13′ and 83° 37′ W. lon. On the S. it adjoins North Carolina for 326 miles and Tennessee for 114 miles; on the W. and N. W. it adjoins Kentucky for 115 and West Virginia (by a very irregular line) for 450 miles; on the N. W. and N. it is separated from Maryland by the Potomac river and Chesapeake Bay for 205 miles and by a line of 25 miles across the eastern shore; and E. and S. E. it is bordered by the Atlantic for 125 miles. The boundary-line of the State measures about 1,400 miles. The longest line in the State from the Atlantic S. W. to Kentucky is 476 miles; the longest from N. to S., 192 miles; area, 42,450 sq. miles (27,168,000 acres), of which 2,325 sq. miles are water surface.

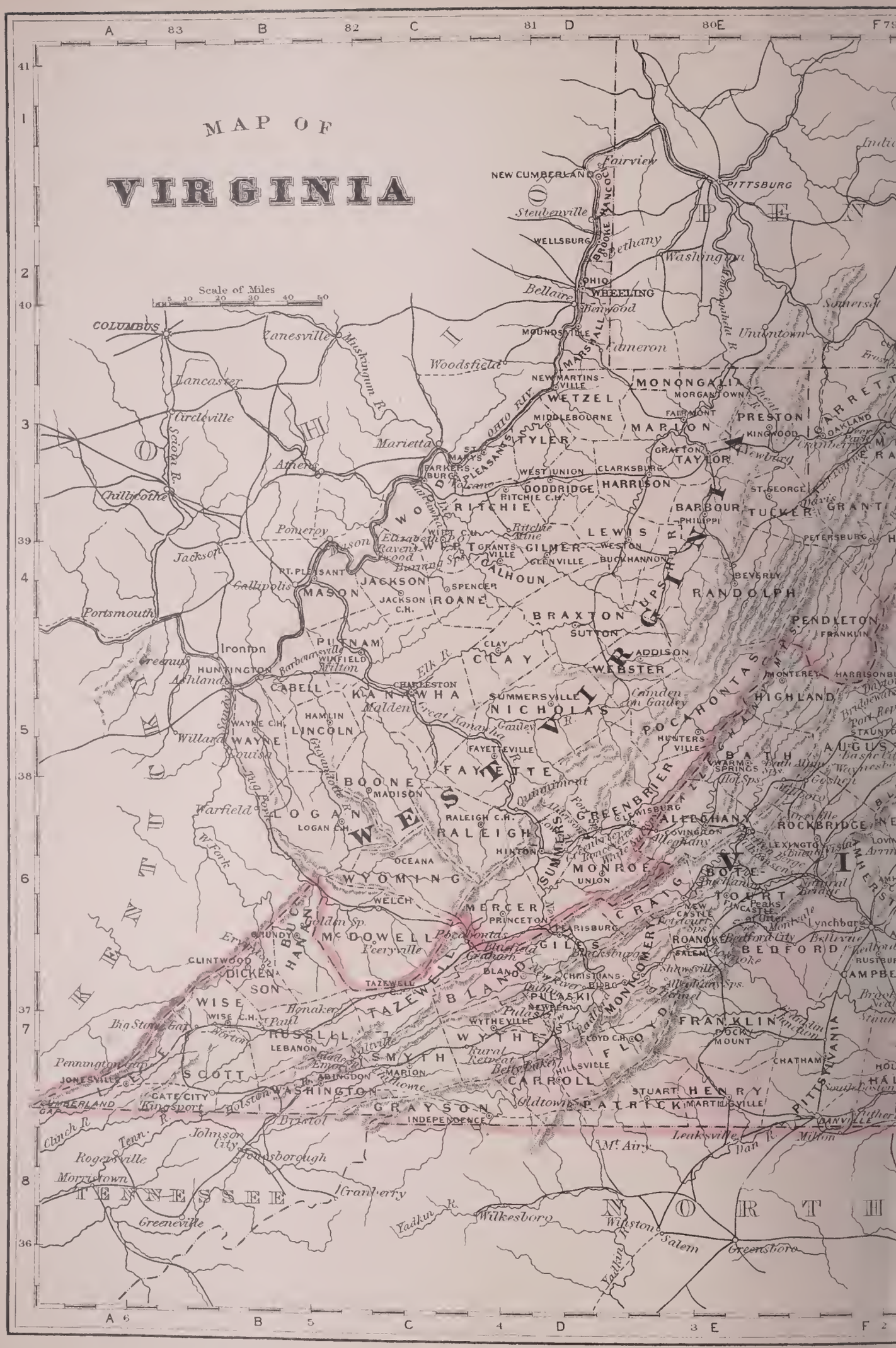
The seal of Virginia.

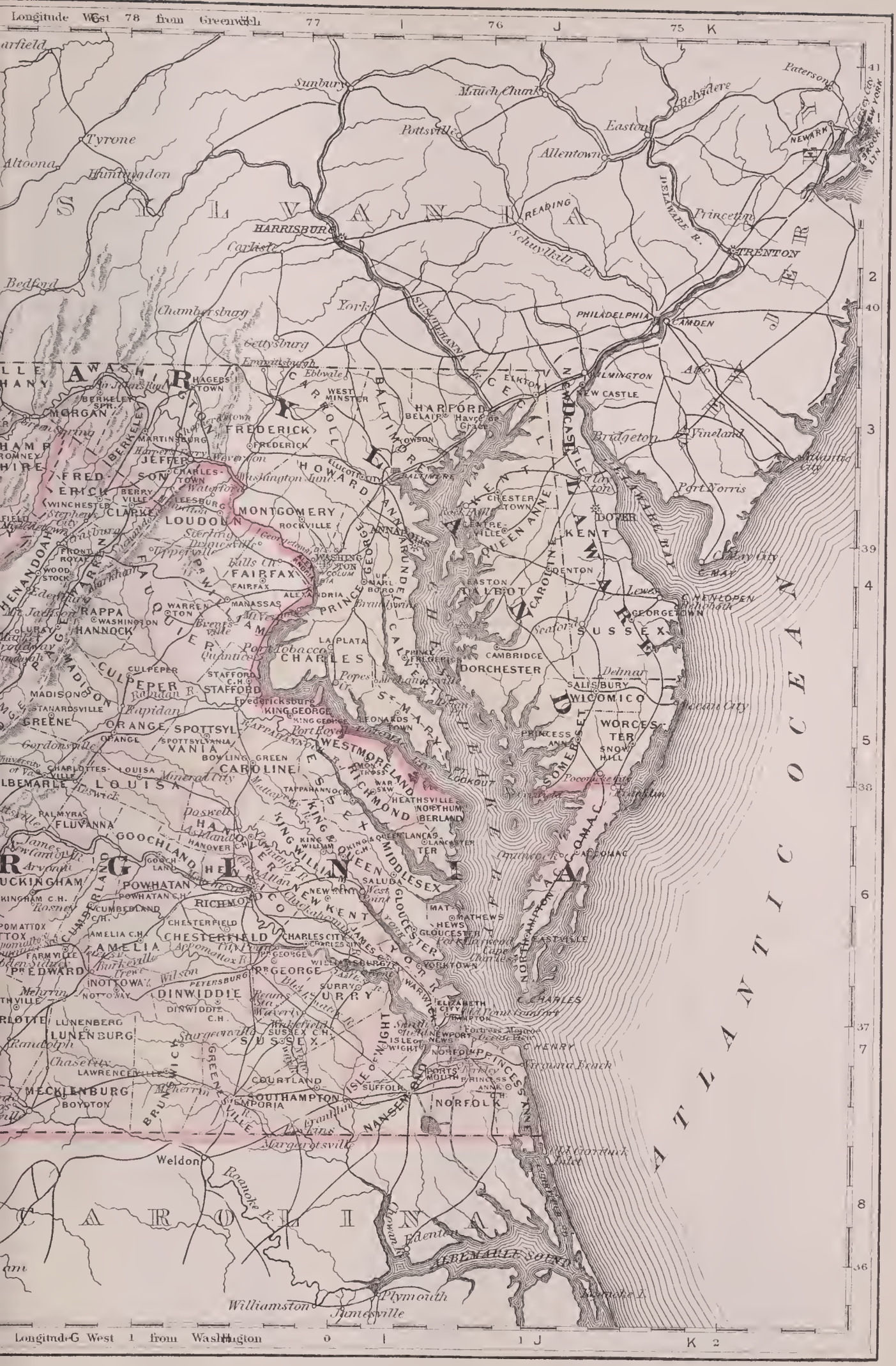
Physical Features.—There are six natural divisions of Virginia, extending across the State from N. E. to S. W., nearly parallel to each other, and corresponding to the trend of the Atlantic coast on the E. and the Appalachian system of mountains on the N. W., known in the order of succession from the ocean as (1) the Tidewater country, (2) Middle Virginia, (3) the Piedmont section, (4) the Blue Ridge country, (5) the Great Valley of Virginia, (6) the Appalachian country. These divisions occupy different levels above the sea, rising to the W. in terraces, and differ in climate, soil, productions, etc. In the Tidewater country every portion is penetrated by the tidal waters of the Chesapeake Bay and its tributary rivers, creeks, bays, and inlets. The united waters of nearly all this section, with those that drain 50,000 sq. miles of country, flow out through the channel, 12 miles wide, between Capes Charles and Henry. The Middle Virginia region is a great, moderately undulating plain from 25 to 100 miles wide, rising to the N. W. from an elevation of 150–200 feet above tide at the rocky rim of its eastern border to 300–500 feet along its northwestern. The Piedmont section is one in which the mountains present themselves in their grand as well as their diminutive forms—gradually sinking into the plains, giving great diversity and picturesqueness to the landscape. The Blue Ridge country, for two-thirds of its length (310 miles), is embraced in the Valley and Piedmont counties that have their common lines upon its watershed; it is only the southwestern portion, where it expands into a plateau, with an area of some 1,230 sq. miles, that forms a separate political division. This division contains the counties of Floyd, Carroll, and Grayson, all watered by the Kanawha or New river, a tributary of the Ohio, and its branches, except a little valley in the southwest corner of Grayson County, which sends its waters to the Tennessee. The Great Valley is a continuous one, clearly defined by the surrounding mountains, but it is really the valley of five rivers. These, with their lengths are, from the N. E.: The Shenandoah, 136 miles; the James River, 50 miles; the Roanoke River, 38 miles; the Kanawha or New River, 54 miles; and the Holston, or Tennessee, 52 miles—total, 330 miles. As a whole, the valley rises to the S. W, being 242 feet above the tide where the Shenandoah enters the Potomac and the united rivers break through the Blue Ridge at Harper's Ferry, and 1,687 feet where the waters of the Holston enter Tennessee. The Appalachian country succeeds the Great Valley on the W., and is traversed its whole length by the Appalachian system of mountains. It is a series of long, narrow, parallel valleys, extending N. E. and S. W., separated from each other by mountain ranges that are generally equally narrow, long, and parallel, and quite elevated.

The only lake in the State is Lake Drummond, in the southeastern part (Dismal Swamp). The waters belonging to the Atlantic system drain six-sevenths of the State. The principal stream is the Potomac, with its large branches, the Shenandoah and the South Branch, and its prominent smaller ones, Potomac creek, Occoquan river, Broad Run, Goose, Catoctin, and Opequon creeks; the Rappahannock, with the Rapidan and numerous other branches, flows from the Blue Ridge across the Piedmont, Middle, and Tidewater divisions; the Plankatank drains a portion of Tidewater; and Mobjack Bay and its rivers furnish deep entrances to the Gloucester peninsula. The York, with its Pamunkey and Mattapony branches, and many tributaries, flows through a considerable area of Middle and Tidewater country. The James, with the Chickahominy, Elizabeth, Nansemond, Appomattox, Rivanna, Willis, Slate, Rockfish, Tye, Pedlar, North, Cowpasture, Jackson, and other streams drains more of the State than any other river. The Elizabeth is a broad arm of the Hampton Roads estuary of the James, extending for 12 miles. All these flow into Chesapeake Bay. The Chowan, through its Blackwater, Nottoway, and Meherrin branches and their affluents, waters portions of Middle and Tidewater Virginia. The Roanoke, called the Staunton from the mouth of the Dan to the Blue Ridge, receives the Dan, Otter, Pig, and many other streams from the Valley and Piedmont and Middle Virginia, and then flows through North Carolina to Albemarle Sound, joining the Chowan. The waters of the Ohio system drain the remaining seventh of the State. The principal streams are the Kanawha or New river, which rises in North Carolina, flows through the plateau of the Blue Ridge, from which it receives Chestnut, Poplar Camp, Reed Island, and other creeks, and Little river; across the Valley, where Cripple, Reed, and Peak's creeks join it; across Appalachia, from which Walker, Sinking, Big and Little Stony, and Wolf creeks, and East and Bluestone rivers flow into it; and then through West Virginia into the Ohio. The Holston, through its South, Middle, and North Forks, Moccasin creek, etc., drains the southwestern portions of the Valley and Appalachia; and the Clinch, by its North and South Forks, Copper creek, Guest and Powell rivers, and other tributaries, waters the extreme southwest of the Appalachian country. These flow into the Tennessee. A portion of the mountain country gives rise to the Louisa and Russell's Forks of the Big Sandy river, and to some branches of the Tug Fork of the same river.

Mountains extend W. from the foot of the low broken ranges that, under the names of Catocton, Bull Run, Yew, Clark's, Southwest, Carter's, Green, Findlay's, Buffalo, Chandler's, Smith's, etc., cross the State S. W. from the Potomac, near the northern corner of Fairfax County, to the North Carolina line, forming the eastern outliers of the Appalachian system. The Blue Ridge, where the Potomac breaks through, attains an elevation of 1,450 feet; Mt. Marshall, near the S. of Front Royal, is 3,369 feet high; Rockfish Gap is 1,996 feet; and James river, where it passes through the Ridge, is 706 feet above tide. The Peaks of Otter, in Bedford County, are 3,993 feet, and the Balsam Mountain, in Grayson, is 5,700 feet high. The distant ranges W. of the Great Valley are called the Appalachian, Kittany, or Alleghany Mountains. Many are bold, but only one peak, Elliott's Knob, in Augusta County, vies with the high peaks of the Blue Ridge. Few States have more wonderful and interesting natural curiosities than Virginia. Its caves, natural bridges, and waterfalls alone repay the tourist for an extended trip.

Geology and Mineral Resources.—The geology of the State was determined by Prof. William Barton Rogers in 1835–40. The formations, like the geographical divisions,


MAP OF
VIRGINIA
Scale of Miles
COLUMBUS
Zanesville
Lancaster
Circleville
Chillicothe
Athens
Marietta
Pomeroy
Jackson
Gallipolis
Portsmouth
Ironton
Greenup
Ashland
Willard
Warfield
Louisa
Pennington Gap
Big Stone Gap
Jonesville
Cumberland Gap
Rogersville
Morristown
Greeneville
Johnson City
Bristol
Kingsport
Abingdon
Wise
Pulaski
Radford
Lynchburg
Danville
Leaksville
Mt. Airy
Milton
Wilkesboro
Winston-Salem
Greensboro
Cranberry
Yadkin R.
Tenn. R.
Clinch R.
Holston R.
Scioto R.
Muskingum R.
Ohio R.
Kanawha R.
Elk R.
Gauley R.
Greenbrier R.
Monongahela R.
Potomac R.
Dan R.
Pittsburg
New Cumberland
Steubenville
Wellsburg
Bethany
Washington
Fairview
Wheeling
Bellaire
Benwood
Moundsville
Cameron
Uniontown
Somerset
Woodsfield
New Martinsville
Morgantown
Fairmont
Kingwood
Grafton
Clarksburg
Parkersburg
St. Marys
Middlebourne
West Union
Ritchie C.H.
Grantsville
Glenville
Weston
Buckhannon
Philippi
St. George
Petersburg
Beverly
Spencer
Jackson C.H.
Pt. Pleasant
Ravenswood
Elizabeth
Sutton
Clay
Addison
Webster Springs
Huntington
Barboursville
Wayne C.H.
Hamlin
Charleston
Summersville
Fayetteville
Hunters Ville
Hot Springs
Warm Springs
Madison
Logan C.H.
Raleigh C.H.
Hinton
Lewisburg
Alleghany
Covington
Lexington
Rockbridge
Oceana
Union
Welch
Princeton
Pearisburg
Roanoke
Salem
New Castle
Fincastle
Peaks of Otter
Bedford City
Lynchburg
Clintwood
Dickenson
Tazewell
Wise C.H.
Lebanon
Marion
Wytheville
Christiansburg
Newbern
Floyd C.H.
Rocky Mount
Chatham
Hillsville
Abingdon
Gate City
Jonesville
Independence
Martinsville
Stuart
Patrick
Oldtown
Rural Retreat
Bethel
Fincastle
Pennington Gap
Tazewell
Buchanan
Grundy
Kentucky
Tennessee
Virginia
North Carolina
Pennsylvania
Ohio
Maryland
Marshall
Brooke
Hancock
Ohio
Wetzel
Monongalia
Preston
Marion
Tyler
Taylor
Harrison
Doddridge
Ritchie
Barbour
Tucker
Grant
Pleasants
Wood
Gilmer
Lewis
Upshur
Randolph
Pendleton
Calhoun
Jackson
Mason
Roane
Braxton
Putnam
Kanawha
Clay
Webster
Nicholas
Pocahontas
Highland
Cabell
Wayne
Lincoln
Boone
Fayette
Greenbrier
Bath
Logan
Raleigh
Summers
Monroe
Allegheny
Rockbridge
Wyoming
Mercer
Bland
Giles
Botetourt
McDowell
Craig
Roanoke
Bedford
Wise
Tazewell
Pulaski
Wythe
Smyth
Russell
Scott
Washington
Carroll
Grayson
Floyd
Franklin
Henry
Patrick
Stuart
Pittsylvania
Campbell
Halifax
Buckingham
Cumberland
Prince Edward
Nottoway
Amherst
Rockingham
Augusta
Staunton
Harrisonburg
Monterey
Pendleton
Franklin
Randolph
Tucker
Grant
Hardy
Frederick
Clarke
Loudoun
Fairfax
Fauquier
Rappahannock
Culpeper
Madison
Orange
Albemarle
Nelson
Fluvanna
Louisa
Goochland
Powhatan
Chesterfield
Dinwiddie
Prince George
Sussex
Southampton
Greensville
Brunswick
Mecklenburg
Charlotte
Halifax
Pittsylvania
Henry
Patrick
Stuart
Franklin
Bedford
Campbell
Appomattox
Buckingham
Cumberland
Prince Edward
Nottoway
Amelia


Longitude West 78 from Greenwich
77
76
75
Sunbury
Mauch Chunk
Pottsville
Easton
Allentown
Bethlehem
Paterson
Tyrone
Altoona
Huntingdon
PENNSYLVANIA
HARRISBURG
Carlisle
READING
Schuylkill R.
DELAWARE R.
Princeton
TRENTON
Bedford
Chambersburg
York
SUSQUEHANNA R.
PHILADELPHIA
CAMDEN
Gettysburg
Emmitsburg
WILMINGTON
NEW CASTLE
ELKTON
HAGERSTOWN
WEST MINSTER
HARFORD
BELAIR
Havre de Grace
FREDERICK
MARTINSBURG
BERKELEY SPR.
MORGAN
JEFFERSON
CHARLESTOWN
WINCHESTER
CLARKE
LEESBURG
LOUDOUN
MONTGOMERY
ROCKVILLE
HOWARD
BALTIMORE
ANNAPOLIS
ANNE ARUNDEL
CECIL
Bridgeton
Vineland
Atlantic City
Port Norris
DOVER
KENT
CHESTER TOWN
CENTRE VILLE
QUEEN ANNE
CAROLINE
DENTON
EASTON
TALBOT
Lewes
CAPE MAY
NEWTOWN
GEORGETOWN
SUSSEX
CAMBRIDGE
DORCHESTER
SALISBURY
WICOMICO
WORCESTER
PRINCESS ANN
SOMERSET
Ocean City
FAIRFAX
ALEXANDRIA
MANASSAS
WARRENTON
RAPPAHANNOCK
HANNOCK
PRINCE GEORGE
PRINCE FREDERICK
CALVERT
ST. MARY'S
CHARLES
Port Tobacco
LA PLATA
CULPEPER
STAFFORD
Fredericksburg
KING GEORGE
MADISON
GREENE
ORANGE
SPOTTSYLVANIA
KING WILLIAM
WESTMORELAND
RICHMOND
CAROLINE
LOUISA
ALBEMARLE
FLUVANNA
HANOVER
KING & QUEEN
LANCASTER
NORTHUMBERLAND
HEATHSVILLE
Lookout
Pocomoke City
Crisfield
GOOCHLAND
POWHATAN
RICHMOND
MIDDLESEX
ESSEX
NEW KENT
GLOUCESTER
MATHEWS
YORKTOWN
CHESTERFIELD
AMELIA
PRINCE EDWARD
NOTTOWAY
DINWIDDIE
PRINCE GEORGE
SURRY
JAMES CITY
WARWICK
ELIZABETH CITY
HAMPTON
Fortress Monroe
NORTHAMPTON
ACCOMAC
CHARLES
LUNENBURG
SUSSEX
ISLE OF WIGHT
NEWPORT NEWS
NORFOLK
PORTSMOUTH
PRINCESS ANNE
HENRY
Virginia Beach
MECKLENBURG
BOYDTON
COURTLAND
SOUTHAMPTON
SUFFOLK
EMPORIA
NORFOLK
NANSEMOND
BRUNSWICK
GREENSVILLE
Weldon
Roanoke R.
Margaretsville
Edenton
ALBEMARLE SOUND
Plymouth
Williamston
Jamesville
ATLANTIC OCEAN
Longitude West 1 from Washington
0
1
K 2

succeed each other in belts, either complete or broken, nearly parallel with the Atlantic coast. The formations in their order, from the Atlantic at the Virginia capes to the N. W. across the State, are as follows: Tidewater: 1, Quaternary; 2, Upper Tertiary; 3, Middle Tertiary; 4, Lower Tertiary. Middle: 5, Triassic and Jurassic; 6, Azoic and granitic. Piedmont: 7, Azoic, Epidotic, etc. Blue Ridge: 8, Azoic and Cambrian. The Great Valley: 9, Cambrian and Silurian. Appalachia: 10, Subcarboniferous and Devonian; 11, Silurian; 12, Devonian and Subcarboniferous; 13, Great Carboniferous.

The mineral resources are, in Tidewater Virginia, several kinds of marls, greensand, etc., highly esteemed as fertilizers, and choice clays, sand, and shell-limestone for building purposes; in the Middle section, granites, gneiss, brownstone, sandstone, brick and fire clay, soapstone, marble, slate, epidote in various forms, limestone, gold, silver, copper, red and brown hematite, magnetic and other ores, and bituminous coal; in Piedmont Virginia, granite, marble, sandstone, brick and fire clays, epidotic rocks and limestone, hematite, magnetic and other iron ores, barytes, lead, and manganese ores; in the Blue Ridge district, copper ores, red and brown hematite, and other iron ores, greenstone, sandstone, freestone, glass sand, manganese ores, and brick and fire clays; in the Great Valley, limestone for building and agricultural uses, marble, slates, freestones, sandstones, brick and fire clays, kaolin, hematite, lead and zinc ores, tin ore, semi-anthracite coal, and travertine marls; in the Appalachian country, limestones, marbles, freestones, slates, calcareous marls, brick clay, red, brown, and other iron ores, salt, and bituminous coal. In the Middle Virginia, Piedmont, and Great Valley divisions are choice mineral waters.

Soil and Productions.—In the Tidewater division the soil of the low, flat, sandy shores is naturally thin, light, and soft; at the same time it is warm and under the influence of a mild climate. The second bottoms (a second terrace above the water) are the rich lands of the country; they are composed of loams of various qualities, all highly valuable, the subsoil being a dark-red or yellow clay. Along the streams of the Middle country transported materials of decomposed rocks have been deposited, giving everywhere rich soils in the bottom-lands. The soils of the Piedmont division are much more epidotic and therefore more fertile than those farther E. The red and chocolate soils of this section, formed from the decomposed dark greenish-blue sandstone, are generally considered the most fertile. The other soils of this region are grayish or yellowish, and less fertile. The Blue Ridge is composed of much the same material as the Piedmont, but it is richer in the abundance of greenstone rocks, which impart to the soil a wonderful fertility and adapt it to the growth of rich grasses, vines, and orchards. The soils of the Great Valley, generally limestone, are well adapted to the growth of grass and grain.

The forests of Virginia are large in extent and the timber is greatly varied, including several species of pine, oak, hickory, elm, poplar, willow, beech, birch, walnut, maple, cedar, mulberry, locust, sycamore, and other timber-trees, besides the juniper, chestnut, cypress, mulberry, linden, catalpa, persimmon, cottonwood, dogwood, sassafras, numerous nut-trees, and a considerable range of fruit-trees.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.
Total number of farms	118,517	127,600	*7·7
Total acreage of farms	19,835,785	19,104,951	†3·7
Value of farms, including buildings and fences	$216,028,107	$254,490,600	*17·8

* Increase. † Decrease.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1900:

CROPS.	Acreage.	Yield.	Value.
Corn	1,761,485	28,183,760 bush.	$13,810,042
Wheat	791,759	9,421,932 "	6,783,791
Oats	349,160	5,167,568 "	1,912,000
Rye	35,250	370,125 "	214,672
Buckwheat	4,524	58,812 "	32,347
Potatoes	38,341	2,223,778 "	1,312,029
Tobacco (1896)	92,002	57,961,260 lb.	3,013,986
Hay	507,873	589,133 tons	7,835,469
Totals	3,580,394	.....	$34,914,336

The cotton crop in 1900 was 8,007 bales.

On Jan. 1, 1900, the farm animals comprised 236,279 horses, value $10,797,007; 36,358 mules, value $2,176,305; 242,488 milch cows, value $5,831,836; 325,000 oxen and other cattle, value $7,787,812; 376,918 sheep, value $1,164,676; and about 950,000 swine, value $4,000,000—total head, 2,167,043; total value, $31,757,636.

In 1899 the production of coal was 2,105,791 short tons, valued at $1,304,241, an increase of 290,517 tons over the output of the previous year. The chief coal-producing counties are Wise (1,232,613 short tons), Tazewell, Montgomery, Henrico, and Pulaski. Virginia and West Virginia together in 1899 produced 17,173 long tons of red hematite iron ore, 968,143 tons of brown hematite, and 1,160 tons of magnetite—total production, 986,476 tons; value, $1,766,410. Of the total, Virginia produced all but a very small amount, ranking first of the States in yield of brown hematite. Virginia also ranked first in production of manganese ore, 6,228 long tons, value $53,069; its highest production was in 1886, 20,567 tons. Other productions were: Granite, output valued at $223,380; slate, $183,110, principally for roofing; limestone, $255,640; sandstone, $8,000; soapstone, 10,886 short tons, valued at $107,062; cement, 10,886 barrels, valued at $107,062; and gypsum, 8,378 short tons, valued at $23,388. Tin-mining, carried on at the head-waters of Irish creek, in the northeastern part of Rockbridge County, was hindered by litigation. There were 47 mineral-spring resorts in 1899, and 39 mineral springs whose waters were bottled and sold (with a product of 954,689 gallons, valued at $341,769), the principal ones being scattered over fifteen counties.

Climate.—The climate ranges from the temperate of the plains in the S. E., fronting the Atlantic, to the cold of the northwestern mountain plateaus, is generally dry and mild, and is healthful the year round. The mean annual temperature for twenty years is 57°. For 1893, annual, 54·6°; monthly, January, 25·6°, July, 76·7°. Annual average mean for Tidewater division, 56°; Middle Virginia, 55°; Piedmont and Blue Ridge, 54°; the Valley, 52°; Appalachia, 51°. From tabulated returns of observations made at thirteen stations, representing nearly all the sections of the State, the mean annual average of rainfall for twenty-one years (1872–92) was found to be 42·99 inches.

Divisions.—For administrative purposes Virginia is divided into 100 counties and 18 independent cities:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Accomac	6-J	27,277	32,570	Accomac	....
Albemarle	5-G	32,379	28,473	Charlottesville †	5,241
Alexandria	4-I	18,597	6,430	Fort Myer	.....
Alleghany	5-E	9,283	16,330	Covington	2,950
Amelia	6-G	9,068	9,037	Amelia	....
Amherst	6-F	17,551	17,864	Amherst	.....
Appomattox	6-F	9,589	9,662	West Appomattox	.....
Augusta	5-F	37,005	32,370	Staunton	.....
Bath	5-E	4,587	5,595	Warm Springs †	1,109
Bedford	6-E	31,213	30,356	Bedford City	2,416
Bland	7-D	5,129	5,497	Bland	.....
Botetourt	6-E	14,854	17,161	Fincastle	652
Brunswick	7-H	17,245	18,217	Lawrenceville	760
Buchanan	7-B	5,867	9,692	Grundy	200
Buckingham	6-G	14,383	15,266	Buckingham	.....
Campbell	7-F	41,087	23,256	Rustburg †	5,403
Caroline	5-H	16,681	16,709	Bowling Green	458
Carroll	7-D	15,497	19,303	Hillsville	.....
Charles City	6-H	5,066	5,040	Charles City	.....
Charlotte	7-F	15,077	15,343	Smithville	96
Chesterfield	6-H	26,211	18,804	Chesterfield	.....
Clarke	3-G	8,071	7,927	Berryville	938
Craig	6-E	3,835	4,293	Newcastle	299
Culpeper	5-G	13,233	14,123	Culpeper	1,618
Cumberland	6-G	9,482	8,996	Cumberland	.....
Dickenson	7-B	5,077	7,747	Clintwood	255
Dinwiddie	7-H	13,515	15,374	Dinwiddie	.....
Elizabeth City	7-I	16,168	19,460	Hampton	3,441
Essex	5-I	10,047	9,701	Tappahannock	554
Fairfax	4-H	16,655	18,580	Fairfax	373
Fauquier	4-G	22,590	23,374	Warrenton	1,627
Floyd	7-D	14,405	15,388	Floyd	402
Fluvanna	5-G	9,508	9,050	Palmyra †	1,882
Franklin	7-E	24,985	25,953	Rocky Mount	612
Frederick	3-G	17,880	13,239	Winchester	.....
Giles	6-D	9,090	10,793	Pearisburg	464
Gloucester	6-I	11,653	12,832	Gloucester	.....
Goochland	6-G	9,958	9,519	Goochland	.....
Grayson	7-C	14,394	16,853	Independence	.....
Greene	5-G	5,622	6,214	Stanardsville †	1,513
Greenesville	7-H	8,230	9,758	Emporia	1,027
Halifax	7-F	34,424	37,197	Houston	687
Hanover	6-H	17,402	17,618	Hanover	.....
Henrico	6-H	103,394	30,062	Richmond	.....

* Reference for location of counties, see map of Virginia.
† District.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Henry	7-E	18,208	19,265	Martinsville	2,384
Highland	5-F	5,352	5,647	Monterey	246
Isle of Wight	7-I	11,313	13,102	Isle of Wight	.....
James City	6-I	5,643	3,688	Williamsburg	.....
King and Queen	6-I	9,669	9,265	King and Queen	.....
King George	5-H	6,641	6,918	King George	.....
King William	5-I	9,605	8,380	King William	.....
Lancaster	6-I	7,191	8,949	Lancaster	.....
Lee	7-A	18,216	19,856	Jonesville †	5,205
Loudoun	4-H	23,274	21,948	Leesburg	1,513
Louisa	5-G	16,997	16,517	Louisa	261
Lunenburg	7-G	11,372	11,705	Lunenburg	.....
Madison	5-G	10,225	10,216	Madison	.....
Mathews	6-I	7,584	8,239	Mathews	.....
Mecklenburg	7-G	25,359	26,551	Boydton	527
Middlesex	6-I	7,458	8,220	Saluda †	2,600
Montgomery	7-D	17,742	15,852	Christiansburg	659
Nansemond	7-I	19,692	23,078	Suffolk	3,827
Nelson	6-F	15,336	16,075	Lovingston †	4,899
New Kent	6-I	5,511	4,865	New Kent	.....
Norfolk	7-J	77,038	50,780	Portsmouth	.....
Northampton	6-J	10,313	13,770	Eastville	313
Northumberl'd	5-I	7,885	9,846	Heathsville †	2,155
Nottoway	6-G	11,582	12,366	Nottoway	.....
Orange	5-G	12,814	12,571	Orange	536
Page	4-G	13,092	13,794	Luray	1,147
Patrick	7-D	14,147	15,403	Stuart	371
Pittsylvania	7-F	59,941	46,894	Chatham	918
Powhatan	6-G	6,791	6,824	Powhatan	.....
Prince Edward	7-G	14,694	15,045	Farmville	2,471
Prince George	6-H	7,872	7,752	Prince George	.....
Princess Anne	7-J	9,510	11,192	Princess Anne	.....
Prince William	4-H	9,805	11,112	Manassas	817
Pulaski	7-D	12,790	14,609	Newberu	152
Rappahannock	4-G	8,678	8,843	Washington	300
Richmond	5-I	7,146	7,088	Warsaw	.....
Roanoke	6-E	30,101	15,837	Salem	3,412
Rockbridge	6-F	23,062	21,799	Lexington	3,203
Rockingham	5-F	31,299	33,527	Harrisonburg	3,521
Russell	7-B	16,126	18,031	Lebanon	325
Scott	7-A	21,694	22,694	Gate City	521
Shenandoah	4-G	19,671	20,253	Woodstock	1,069
Smyth	7-C	13,360	17,121	Marion	2,045
Southampton	7-H	20,078	22,848	Courtland	288
Spottsylvania	5-H	14,233	9,239	Spottsylvania	.....
Stafford	5-H	7,362	8,097	Stafford	.....
Surry	7-I	8,256	8,469	Surry	.....
Sussex	7-H	11,100	12,082	Sussex †	2,502
Tazewell	7-C	19,899	23,384	Tazewell	1,096
Warren	4-G	8,280	8,837	Front Royal	1,005
Warwick	7-I	6,650	4,888	Denbigh †	632
Washington	7-B	29,020	28,995	Abingdon	1,306
Westmoreland	5-I	8,399	9,243	Montross †	2,129
Wise	7-B	9,345	19,653	Wise	.....
Wythe	7-D	18,019	20,437	Wytheville	3,003
York	7-I	7,596	7,482	Yorktown	151
Independent cities ‡	....	.....	308,017		
Totals		1,655,980	1,854,184		

* Reference for location of counties, see map of Virginia.
† District.
‡ Alexandria, Bristol, Buena Vista, Charlottesville, Danville, Fredericksburg, Lynchburg, Manchester, Newport News, Norfolk, Petersburg, Portsmouth, Radford, Richmond, Roanoke, Staunton, Williamsburg, Winchester.

Principal Cities and Towns, with Population in 1900.—Richmond, 85,050; Norfolk, 46,624; Petersburg, 21,810; Roanoke, 21,495; Newport News, 19,685; Lynchburg, 18,891; Portsmouth, 17,427; Danville, 16,520; Alexandria, 14,528; Manchester, 9,715; Staunton, 7,289; Charlottesville, 6,449; Winchester, 5,161; Fredericksburg, 5,068.

Population and Races.—In 1860, 1,219,630; 1870, 1,225,163; 1880, 1,512,565; 1890, 1,655,980 (native, 1,637,606; foreign, 18,374; males, 824,278; females, 831,702; white, 1,014,680; colored, 641,300, of whom 640,867 were persons of African descent, 50 Chinese, 13 Japanese, and 370 civilized Indians).

Industries and Business Interests.—In 1890 the census returns showed that 5,915 manufacturing establishments reported. These had a combined capital of $63,456,799; investment in plants, $34,962,393, including value of machinery, tools, and implements, $18,348,110; employed 59,591 persons; paid for wages $19,644,850, for materials used $50,148,285, and for miscellaneous expenses $7,421,087; and had an output of goods valued at $88,363,824. These totals show an increase over those for 1880 as follows: Number of establishments, 205; capital employed, $36,487,809; persons employed, 9,407; amount of wages paid, $12,219,589; and value of manufactured output, $36,583,132. In 1880 the principal manufactures were of tobacco, flour and grist, iron and steel, lumber, cotton goods, machine-shop products, leather, and agricultural implements. The following table shows the manufactures of which the output was valued at $1,000,000 and upward each in 1890:

MANUFACTURES.	Establishments.	Persons employed.	Wages paid.	Cost of materials.	Value of output.
Tobacco, chewing, smoking, and snuff	93	10,085	$2,142,385	$4,825,432	$11,804,813
Flour and grist mill products	1,179	2,200	657,591	9,849,144	11,716,356
Tobacco, stemming and rehandling	101	1,821	433,685	5,420,492	6,487,643
Lumber-mill products from logs and bolts	638	5,980	1,361,638	2,905,958	5,541,825
Iron and steel	17	1,483	633,444	2,943,216	4,104,850
Tobacco, cigars, and cigarettes	102	2,428	785,187	1,463,878	3,727,842
Foundry and machine-shop products	59	2,082	1,034,024	1,206,227	2,739,695
Fertilizers	28	687	260,939	1,739,138	2,475,638
Planing-mill products	65	1,272	567,071	1,252,291	2,350,281
Nails and spikes	4	1,594	578,716	1,343,466	2,068,731
Cotton goods	9	2,019	406,824	1,199,578	1,732,648
Printing and publishing	205	1,373	674,553	397,307	1,626,938
Brick and tile	88	2,441	607,211	214,553	1,343,598
Boots and shoes	7	272	139,888	874,564	1,279,069
Leather, tanned and curried	82	459	159,026	805,487	1,224,800

In 1893 there were 32 blast furnaces, 10 rolling-mills and steel-works, 146 cut-nail machines, and a large wire-nail factory in operation. The production of pig iron in 1899 was 365,491 long tons. Two coking plants had 1,588 ovens in operation and 429 other ovens were being built in 1899. During the year 994,635 tons of coal were used, from which were produced 618,707 short tons of coke, valued at $1,071,284. In the fiscal year 1899–1900 the internal revenue collections on taxable manufactures aggregated $5,433,820.05. Tidewater Virginia has large interests in the oyster, clam, terrapin, and turtle industries, and in the herring, shad, and menhaden fisheries. The proceeds of the fisheries, according to the census, were valued at $4,816,425 in 1890.

Commerce.—During the fiscal year ending June 30, 1900, the imports of foreign merchandise at the ports of Alexandria, Newport News (changed from Yorktown in 1888), Norfolk and Portsmouth, and Richmond aggregated in value $3,203,784, and the exports of domestic commodities $47,870,419. Virginia also has a large interstate traffic by rail and water, receiving and shipping raw materials and manufactured articles, and shipping large quantities of lumber, vegetables, and other productions.

Finances.—The assessed valuations in 1893 were: White taxpayers, real property $296,371,055, personal $90,373,044, total $386,744,099; colored taxpayers, real property $9,829,583, personal $3,465,370, total $13,294,953; total real property $306,200,638, total personal $93,838,414; grand total $400,039,052. In 1894 the totals were: Real property $310,201,514, personal $86,590,188; grand total $396,791,702. The total public debt on Oct. 1, 1894, was $23,704,029, which included $16,359,860 in bonds issued under the debt-settlement legislation, and the net debt was $23,367,029.

Banking.—In 1900 there were 43 national banks with combined capital of $5,171,000, surplus and profits of $3,987,068.84, and deposits of $20,473,458.43; and 95 State banks with combined capital of $3,966,870, surplus and profits of $3,264,215, and deposits of $22,451,581.

Post-offices and Periodicals.—In Jan., 1901, there were 3,612 post-offices, of which 65 were presidential (3 first-class, 14 second-class, 48 third-class) and 3,547 fourth-class, and of the total 785 were money-order offices, and 21 money-order stations. Of newspapers and periodicals reported in 1901, there were 31 daily, 2 tri-weekly, 6 semi-weekly, 161 weekly, 2 semi-monthly, 39 monthly, 2 bi-monthly, and 1 quarterly publications—total, 244.

Means of Communication.—In 1899 there were 3,684·24 miles of railway lines. The main systems having large connections outside the State were the Chesapeake and Ohio, the Norfolk and Western, the Southern, the Atlantic Coast Line, and the Baltimore and Ohio. Two of the trunk lines extended through the great coal-fields and terminated at Hampton Roads, taking numerous coal-trains to Newport News on the north shore and Lambert's Point and Norfolk on the south, and connecting with regular lines of ocean steamers. There are steamboat lines running regularly between Norfolk and Philadelphia, Baltimore, Washington, Richmond, Petersburg, North Carolina ports, and Fredericksburg; also between Richmond and New York, and Fredericksburg and Baltimore.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Baptist, Regular, Colored	1,046	1,052	203,048	$1,257,035
Methodist Episcopal South	1,172	1,155	105,892	2,183,565
Baptist, Regular, South	787	800	92,693	1,859,292
Presbyterian in the U. S.	290	363	26,515	1,180,576
Protestant Episcopal	245	334	20,371	1,697,375
Methodist Episcopal	316	316	16,764	329,144
Disciples of Christ	161	148	14,100	240,929
Roman Catholic	69	69	12,356	458,800
African Methodist Episcopal	67	102	12,314	187,245
African Meth. Episcopal Zion	72	72	11,765	68,449
Lutheran, United Synod in the South	145	140	11,196	314,200
Baptist, Primitive	226	222	9,608	90,005
Dunkards, Conservative	42	94	6,659	73,523
United Brethren in Christ	71	68	5,306	65,940
Methodist Protestant	57	57	4,154	94,000
Reformed Church in the U. S.	20	22	1,819	44,800
Christian Connection	23	21	1,390	8,875
Colored Methodist Episcopal	18	18	1,351	33,150

The whole State constitutes the Protestant Episcopal diocese of Virginia (organized in 1785). The eastern part comprises the Roman Catholic diocese of Richmond (established in 1821), and the remainder of the State is in the diocese of Wheeling (established in 1850).

Schools.—The public-school system is administered by a State board of education, consisting of the Governor, the attorney-general, and the superintendent of public instruction. This board controls the State school fund, and appoints and removes county and city superintendents, subject to confirmation by the Senate. The schools are free to all children between five and twenty-one years of age. Equal educational privileges are secured by law to white and colored children, with the provision, however, that they shall be taught in separate schools. In 1893 there was a school population of 377,595 white children and 275,831 colored (653,426), of whom 227,696 white and 120,775 colored (348,471) were enrolled in the public schools, and 130.398 white and 63,745 colored (194,143) were in average daily attendance. There were 5,679 schools for white pupils and 2,064 for colored (7,743), and 5,868 white teachers and 2,064 colored (7,932). In 1899 the total number of children of school age was 665,865, of whom 358,825 were enrolled in the public schools and 203,136 in daily attendance. There were 7,218 schools and 8,836 teachers—2,909 men, and 5,927 women. The average monthly salaries were: men, $32.09; women, $26.39. The value of school property was $3,336,166; the revenue for school purposes, $2,010,624; and the expenditure, $1,971,264. The universities and colleges of liberal arts were the State University (see VIRGINIA, UNIVERSITY OF); HAMPDEN-SIDNEY COLLEGE (*q. v.*), at Hampden-Sidney; WASHINGTON AND LEE UNIVERSITY (*q. v.*), at Lexington; RANDOLPH-MACON COLLEGE (*q. v.*), at Ashland; RICHMOND COLLEGE (*q. v.*), at Richmond; ROANOKE COLLEGE (*q. v.*), at Salem: Emory and Henry College (chartered 1837), at Emory; and the Polytechnic Institute, at New Market. State aid is given to the State University, the Virginia Military Institute, the Virginia Agricultural and Mechanical College, the State Female Normal School, the College of William and Mary (State Male Normal School, see WILLIAM AND MARY, COLLEGE OF), the Medical College of Virginia, the Virginia Normal and Collegiate Institute, and the Hampton Normal and Agricultural Institute. The Miller Manual Labor School, at Crozet, has an endowment of $1,300,000.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, Virginia had 50 libraries, containing 340,110 bound volumes and 30,800 pamphlets. The libraries were classified as follows: General, 6; school, 13; college, 13; college society, 5; law, 2; theology, 3; Y. M. C. A., 3; scientific, 2; historical, 1; garrison, 1; and society, 1. The State Library was completed in 1894, at a cost of $174,200.

Charitable, Reformatory, and Penal Institutions.—Among these are the Virginia Institution for the Education of the Deaf and Dumb and the Blind, at Staunton; four State asylums for the insane, the Western, at Staunton, the Eastern, at Williamsburg, the Southwestern, at Marion, and the Central, near Petersburg; an Industrial Reform School for white boys, at Laurel; a penitentiary, at Richmond; and county and city jails and almshouses.

Political Organization.—The executive power is vested in a Governor, elected for four years and ineligible for a second consecutive term, who must be a citizen of the U. S., thirty years old, and a resident of the State for three years prior to his election. If foreign born, he must have been a resident of the U. S. for ten years. A Lieutenant-Governor is elected at the same time, for the same term, and under the same qualifications as the Governor, and succeeds the Governor on his death or removal from office. Other State officers are a secretary of the commonwealth, treasurer, first and second auditors, register of the land office, superintendent of the penitentiary, railway commissioner, and public printer, each elected for two years by the General Assembly, and a commissioner of agriculture appointed by the Governor. The legislative authority is vested in a General Assembly, consisting of a Senate of 40 members and a House of Delegates of 100 members, each elected for two years. The judicial authority is vested in a supreme court of appeals of five judges, elected by the General Assembly for a term of twelve years; circuit courts, of which there are sixteen judges, elected by the General Assembly for a term of eight years; and county courts of one judge each, similarly elected for six years. The elective franchise is given to all males twenty-one years old and upward who are citizens of the U. S. and residents of the State one year, of the county three months, of the town three months, and of the precinct thirty days prior to the election, excepting idiots, lunatics, persons convicted of bribery in any election, embezzlement of public funds, treason, felony, or petty larceny, and persons engaged in dueling as principals or abettors. A modification of the Australian ballot law is in force.

History.—Virginia was the earliest settled of the English colonies. On May 13, 1607, a party of 105 persons, sent out by the London Virginia Company, landed at what is now known as Old Jamestown. It was mostly composed of needy adventurers, and the whole company would have perished but for the enterprise of Capt. John Smith. Smith took command of the colonists, and held it until the officers appointed by the London Virginia Company should make their appearance. Nine vessels had been sent out by the company with 500 colonists, but the one bearing the officers was wrecked on the Bermudas, and one of the other vessels was lost. The remaining seven arrived safely at Jamestown, but the new settlers were as worthless as their predecessors. Having been severely wounded by an accident, Smith was compelled to return to England in Dec., 1609. He left 500 colonists well supplied with all necessaries. Six months later the number had dwindled to 60, and these were on the verge of starvation. At this time (June, 1610), Newport, Gates, and Somers arrived at Jamestown with 150 men and a moderate store of supplies, but finding the colonists in so sad a plight they resolved to abandon Virginia. As they descended the river, they met Lord de la Warr with three ships, bringing supplies and settlers. They then returned to Jamestown, and Lord de la Warr established a trading-post at Hampton. Lord de la Warr's health failing, he returned to England, leaving Capt. George Percy as his deputy. New settlements were made at Henrico and at what is now City Point, and the lands, which had previously been held in common, were divided among the settlers. Lord de la Warr returned to resume the governorship, but died at the entrance of the bay. Sir George Yeardley, who succeeded him, was more popular. The culture of tobacco became profitable; favorable laws were made; servants of two kinds began to come into the colony in 1619—felons or convicts sent over from English prisons and sold to the planters for a term of years, and Negro slaves brought by Dutch vessels from the African coast. In 1624–25 the Virginia Company was dissolved by writ of *quo warranto*, and the colony reverted to the crown. In 1652 the colonists reluctantly submitted to the rule of Cromwell, but in 1660 they reaffirmed their loyalty to the Stuart dynasty. Bacon's Rebellion, which occurred in 1676, was the result of the rapacity of Gov. Berkeley and two favorite courtiers of Charles II. (Arlington and Culpeper), to whom he had given a patent of the Virginia colony. In 1689 the colony reluctantly acknowledged the accession of William and Mary. There were occasional conflicts with the Indians, but these were not serious until 1754, when the French war began. Virginia resented the levying of taxes by the mother country without representation as warmly as did Massachusetts, and in 1765 adopted resolutions denying the right of any foreign body to levy such taxes. The colony was not represented in the first colonial congress of Oct., 1765, but approved its action, and asserted strongly, four years later, its rights and liberties. It was not until the accession of Lord Dunmore as Governor in 1772 that the opposition to the measures of the British ministry began to be generally manifested. Lord Dunmore

became at length so obnoxious to the people by his tyranny that he took refuge on board a British man-of-war off Yorktown, and in June, 1775, sailed down the river, and was declared by the General Assembly to have abdicated his office. He subsequently attacked with a British and Tory force several of the towns along the coast, but was eventually driven south with heavy losses. In May, 1776, a convention of delegates met at Williamsburg, issued a declaration of rights, and on June 12 adopted a State constitution. Committed thus to the Revolution, Virginia was one of the fields of the Revolutionary war, especially toward its close. Naval attacks were made on Norfolk, Portsmouth, and Gosport in 1779, and Benedict Arnold captured and burned Richmond in Jan., 1781. The battle of Jamestown was fought July 9, 1781, and the surrender of Cornwallis (with which the war ended) took place at Yorktown Oct. 19 of the same year. Virginia was prominent in the national convention which framed the Constitution of the U. S., and ratified that Constitution June 25, 1788. In 1784 she ceded to the U. S. her claims to the lands lying N. W. of the Ohio, and soon after this she gave up the territory which forms the present State of Kentucky. In 1849 she changed her constitution, extended the suffrage, and codified her laws. In 1860 and 1861 the people of Virginia were divided in their views on the subject of secession. The convention, called Feb. 13, 1861, to consider the subject, was composed of three classes—unconditional Unionists, unconditional secessionists, and conditional Unionists; the last-named were largely in the majority. There was a long discussion, but on Apr. 17, three days after the capture of Fort Sumter, the ordinance of secession was passed by 88 yeas to 55 nays. It was submitted to the people late in May, and a majority of 94,000 was said to have declared in favor of secession. The western counties opposed it, and as a result the State of West Virginia was formed in October of the same year. Richmond became the capital of the Confederate States on May 21, 1861. The State was occupied by hostile armies during the whole of the civil war that followed, and many of the most important actions of the war, together with the final surrender of Lee's forces at Appomattox, took place within its borders. (See CONFEDERATE STATES.) During a part of this time there were two State governments, the counties which were loyal and under Federal control having instituted a State government at Alexandria in 1863, and Francis H. Pierpont being elected Governor. The legislature of this State government called a convention, which met Feb. 13, 1864, and abolished slavery. After the close of the war, an attempt was made to convene the old Virginia legislature to restore the State to the Union, but, as it was believed that that legislature would act in hostility to the government, its assembling was prohibited, the Pierpont government recognized by President Johnson May 9, and Gov. Pierpont made provisional governor. The State was under military control till Jan. 26, 1870, when it was restored to the Union by Congress under a constitution adopted by the people July, 1869. During Holliday's term as Governor (1878–82) there arose a contest over the State debt which was not settled till 1892, when the debt was adjusted and bonded.

GOVERNORS OF VIRGINIA.

Officers under the Virginia Co.

Edw. M. Wingfield, pres..	1607
John Ratcliffe, pres.....	1607–08
Capt. John Smith, pres...	1608–09
Sir George Percy, pres...	1609
Thomas West, Lord de la Warr, gov.....	1609–11
Thos. Dale, high marshal.	1611–16
George Yeardley, lt.-gov.	1616–17
Captain Samuel Argall, lt.-gov.....	1617–19
Sir Geo. Yeardley, gov...	1619–21
Francis Wyatt.....	1621–25

Governors under the Crown.

Sir George Yeardley.....	1626–27
Francis West.....	1627–28
John Potts.....	1628–29
John Hervey.....	1629–35
John West.....	1635
John Hervey.....	1635–39
Francis Wyatt.....	1639–41
Sir William Berkeley.....	1641–45
Richard Kemp, lt.-gov....	1645
Sir William Berkeley.....	1645–52

Governors (Commonwealth).

Richard Bennett.....	1652–56
Edward Digges.....	1656–58
Samuel Matthews.....	1658–60

Governors under the Crown.

Sir William Berkeley.....	1660–77
Herbert Jeffries, lt.-gov..	1677
Herbert Jeffries, gov.....	1677–78
Henry Chicheley.....	1678–79
Thomas, Lord Culpeper..	1679–80
Henry Chicheley, lt.-gov.	1680–84
Lord Howard of Effingham.....	1684–89
Nathaniel Bacon, lt.-gov..	1689–90
Francis Nicholson, lt.-gov.....	1690–92
Sir Edmund Andros, gov.	1692–98
Fran. Nicholson, gov...	1698–1704
The Earl of Orkney.....	1704–05
Edward Nott, lt.-gov.....	1705–06
Edmund Jennings, lt.-gov.	1706–10
Robert Hunter, lt.-gov....	1710
Alex. Spotswood, lt.-gov..	1710–22
Hugh Drysdale, lt.-gov...	1722–26
Robert Carter, lt.-gov....	1726–27
William Gooch, lt.-gov....	1727–49
John Robinson, Sr., lt.-gov.....	1749
Lord Albemarle, gov.....	1749–50
Louis Burwell, lt.-gov....	1750–52
Robt. Dinwiddie, lt.-gov..	1752–58
John Blair, lt.-gov.....	1758
Francis Fauquier, gov....	1758–68
John Blair, lt.-gov.....	1768
Norborne Berkeley, Lord de Botetourt, gov.... ..	1768–70
William Nelson, lt.-gov...	1770–72
John, Lord Dunmore, gov.	1772–76

State Governors of the Revolutionary Period.

Patrick Henry.....	1776–79
Thomas Jefferson.....	1779–81
Thomas Nelson.....	1781
Benjamin Harrison.....	1781–84
Patrick Henry.....	1784–86
Edmund Randolph.....	1786–88

Governors after adoption of U. S. Constitution.

Beverly Randolph.....	1788–91
Henry Lee.....	1791–94
Robert Brooke.....	1794–96
James Wood.....	1796–99
James Monroe.....	1799–1802
James Page.....	1802–05
William H. Cabell.....	1805–08
John Tyler.....	1808–11
James Monroe.....	1811
George W. Smith.....	1811–12
James Barbour.....	1812–14
Wilson C. Nicholas.....	1814–16
James P. Preston.....	1816–19
Thomas M. Randolph....	1819–22
James Pleasant.....	1822–25
John Tyler.....	1825–27
William B. Giles.....	1827–30
John Floyd.....	1830–34
Littleton W. Tazewell....	1834–36
Windham Robertson (acting).....	1836–37
David Campbell.....	1837–40
Thomas W. Gilmer.....	1840–41
John Rutherford.....	1841–42
John M. Gregory.....	1842–43
James McDowell.....	1843–46
William Smith.....	1846–49
John B. Floyd.....	1849–52
Joseph Johnson.....	1852–56
Henry A. Wise.....	1856–60
John Letcher.....	1860–64
Francis H. Pierpont.....	1864–68
Henry H. Wells.....	1868–70
Gilbert C. Walker.....	1870–74
James L. Kemper.....	1874–78
Fred. W. M. Holliday.....	1878–82
William E. Cameron.....	1882–86
Fitzhugh Lee.....	1886–90
Philip McKenney.....	1890–94
Charles T. O'Ferrall.....	1894–98
J. Hoge Tyler.....	1898–

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THOMAS WHITEHEAD.

Virginia: city (laid out in 1836); capital of Cass co., Ill.; on the Balt. and Ohio S. W. and the Chi., Peo. and St. L. railways; 13 miles E. by S. of Beardstown, 33 miles W. by N. of Springfield (for location, see map of Illinois, ref. 6–C). It is in an agricultural region, and has a public high school, library of the Central Illinois Science Society, 2 national banks with combined capital of $100,000, a private bank, and 2 weekly newspapers. Pop. (1890) 1,602; (1900) 1,600.

Virginia, or **Verginia**: a Roman maiden, daughter of Lucius Virginius, a patrician, and betrothed to Lucius Icilius, a popular democratic leader who had signalized himself in the office of tribune by procuring the passage of the law assigning the Aventine Mount to the plebeians. According to the ordinary histories—which, however, do not merit great confidence—the decemvir Appius Claudius, captivated by the beauty of the maiden, devised with one of his clients an infamous plot to obtain possession of her, under pretense that she was a slave; and when, in spite of all the efforts of the maiden's father and lover, the decemvir had in his magisterial capacity adjudged her to be the slave of his accomplice, Virginius plunged a knife into his daughter's breast in the midst of the Forum. The people, excited by this tragedy, overthrew the government of the decemvirs, re-established the consulate, and made Virginius tribune, by whom Appius was thrown into prison, where he committed suicide (B. C. 449). Revised by G. L. HENDRICKSON.

Virginia City: city (settled in 1859, incorporated in 1861); capital of Storey co., Nev.; on the eastern slope of Mt. Davidson, and on the Virginia and Truckee Railroad; 15 miles N. E. of Gunnison City, 200 miles N. E. of San Francisco (for location, see map of Nevada, ref. 5–E); elevation 7,825 feet above sea-level. It is the largest city in the State; was settled on the discovery of the famous Comstock silver lode; and is built over mines from which over $350,000,000 in gold and silver bullion has been taken. The city has a daily supply of 10,000,000 gal. of water for use for domestic and mining purposes, brought from the Sierra Nevada mountains, 30 miles W., at a cost of $2,500,000, and the principal mines are tapped by the Sutro drain tunnel (4 miles long, cost $4,500,000) at a depth of 1,650 feet. The deepest mining-works have a depth of 3,000 to 3,350 feet. There are in the city numerous great mining-plants erected at a cost of from $350,000 to $1,000,000 each. There are 4 churches, 2 public-school buildings (cost $20,000 and $60,000 respectively), several private schools, branches of two San Francisco banks, county court-house (cost $250,000), county hospital, St. Mary's Hospital, gas and electric-light plants, and a weekly and 2 daily newspapers. Pop. (1880) 10,917; (1890) 8,511; (1900) 2,695, the decrease being due to the decline in the price of silver. GOLD HILL is a mining town 1 mile S. of the city, and was once a place of much importance. DAN DE QUILLE.

Virginia Creeper: See AMPELOPSIS.

Virginia Deer: the *Cariacus virginianus*, or common deer of the Eastern U. S. See DEER.

Virginian Snake-root: See ARISTOLOCHIA.

Virginia, University of: an institution of learning at Charlottesville, Albemarle co., Va.; chartered in 1819 through the influence of Thomas Jefferson, its first rector, who drew up all the statutory enactments relating to it, as well as its basis of organization, code of government, and original plan of studies. It was opened in 1825, and had among its faculty several young English professors, two of whom, George Long and Thomas Hewitt Key, subsequently achieved eminence in connection with London University. Among the peculiar features which distinguish the University of Virginia from all other American institutions, the principal are its division into separate, independent schools, twenty-two in number, each under the charge of a professor, who in several instances has assistant instructors, and the freedom of election in studies granted the student. There is no general curriculum, but students select their schools, usually three in number, for each year, and receive upon examination their respective degrees—namely, for proficiency in separate branches, for graduation in a single school, for the degrees of bachelor of arts, of master of arts, and of doctor of philosophy. The university has also medical, pharmaceutical, law, agricultural, and engineering departments with corresponding degrees. The academic head of the university is the chairman of the faculty, annually chosen by the board of visitors composed of a rector and eight members, appointed by the Governor of Virginia, and confirmed by the Senate, in whom the government is vested. The institution is under State patronage, having enjoyed from the beginning an annual appropriation of $15,000, a sum which in 1875 was increased to $30,000 on condition of free tuition in the academical schools for suitably prepared students who are residents of the State. The annual appropriation was raised to $40,000 in 1884. The gifts in equipments and endowments (including an endowed observatory and an extensive museum of natural history and geology) since 1869 by William W. Corcoran, Lewis Brooks, Leander J. McCormick, William H. Vanderbilt, and others, amount to $600,000. To this is to be added an estate in remainder left by Arthur W. Austin, of Massachusetts, in 1884, valued at $420,000. The department of agriculture was founded in 1869 by Samuel Miller, of Lynchburg, with an endowment of $100,000. The library contains about 54,000 volumes; the number of alumni is about 15,000; and the number of students for the year 1899–1900 was 675, under the tuition of 50 professors and assistants.

WILLIAM M. THORNTON.

Virgin Islands (so called by Columbus in honor of the Eleven Thousand Virgins): a group of islands in the West Indies, forming the northwestern extremity of the Caribbee chain, and lying immediately E. of Puerto Rico. The most important are ST. THOMAS, SANTA CRUZ (*qq. v.*), and St. John, belonging to Denmark. Tortola, Anegada, Virgin Gorda, and some islets, belong to Great Britain, and are attached to the Leeward islands colony; they have an aggregate area of 58 sq. miles, and a population (1891) of 4,639. Culebra, Vieques, etc., are dependencies of Puerto Rico. All the islands are hilly or mountainous. Total area about 250 sq. miles; total pop. about 55,000. H. H. S.

Virgin Mary: See MARY, THE BLESSED VIRGIN.

Virgin's Bower: See CLEMATIS.

Virgo: the sixth sign of the Zodiac, which the sun enters about Aug. 20; also a constellation which formerly marked this sign, but is now in the sign Libra. It is on the meridian during the evenings of May and June, and contains the bright star Spica. S. N.

Viri'athus: a Lusitanian herdsman, who became a leader in the guerrilla war which was carried on in the middle of the second century B. C. on the border between Lusitania and the Roman province of Spain. After some years of guerrilla warfare, in which for the most part Viriathus was signally successful, a peace was concluded with the Romans, by which the Lusitanians were acknowledged as an independent nation and the allies of Rome. But in 140 the consul, Q. Servilius Cæpio, saw fit to invade Lusitania, bribed some persons to murder Viriathus while sleeping, and subjugated the country. Revised by G. L. HENDRICKSON.

Viro'qua: city; capital of Vernon co., Wis.; near the Kickapoo river, and on the Chi., Mil. and St. Paul Railway; 30 miles S. E. of Lacrosse, 35 miles S. of Sparta (for location, see map of Wisconsin, ref. 6–C). It is in an agricultural and lumbering region, and has a high school, a State bank with capital of $25,000, and two weekly papers. The neighborhood is a favorite one among sportsmen because of the trout and game that abound. Pop. (1880) 762; (1890) 1,270; (1900) 1,950.

EDITOR OF "VERNON COUNTY CENSOR."

Virus [from Lat. *vi'rus*, slime, slimy liquid, stench, poison: Gr. *ἰός* (for **Ϝιϝός*): Sanskr. *viṣa-*, poison]: animal fluids produced in diseased conditions or by morbid processes, and capable of developing disease when transmitted to other animal bodies. Thus man may be inoculated by the virus of human origin, smallpox, syphilis, etc., vaccinia of the cow, glanders of the horse, and rabies canina or hydrophobia. (See INOCULATION and VACCINATION.) A minute amount of the virus gaining access to the body is sufficient to infect the entire volume of the blood and contaminate every part of the body. Peculiar organisms, having vitality and tendency to reproduce themselves, constitute the active elements of all viruses. (See BACTERIOLOGY.) Having gained entrance to the system, they for a time seem dormant, but are really multiplying, and this period is well designated as one of "incubation." Thus smallpox appears twelve or more days after admission of virus, vaccinia within a week, hydrophobia on an average in forty days. Hygienic and supporting measures may prepare the body to meet those effects and pass safely through, but, with the exception of malaria and a few other diseases, no specifics are known which are capable of destroying the virus.

Visa'lia: town; capital of Tulare co., Cal.; on the Kaweah river, and the Visalia and Tulare Railroad; 18 miles N. E. of Tulare, 40 miles S. of Fresno (for location, see map of California, ref. 9–E). It was founded in 1852, made the county-seat in 1853, and incorporated in 1874. There are 6 churches, thirteen-room public-school building, 3 State banks with combined capital of $250,000, and 2 daily and 2 weekly newspapers. It is principally engaged in agriculture and fruit growing and canning. Pop. (1880) 1,412; (1890) 2,885; (1900) 3,085. EDITOR OF "DELTA."

Visby: ancient town of Sweden. See WISBY.

Viscacha, or **Biscacha**: See LAGOTIS.

Viscelli'nus, SPURIUS CASSIUS: a Roman statesman and general of the earliest period of the republic, who has received scant justice from the imperial annalists, but deserves to be considered one of the greatest and most illustrious historical figures of the early republic. In his third consulship, in 486 B. C., he made the league with the Hernicans which was the basis of Roman success for the century following. His importance in Roman history is due to the fact that he was the first to introduce an agrarian law which should compel the rich patricians to give up the public land which they held, and rent it out for the benefit of the public treasury, and also divide it in part among needy citizens. His attempt failed, although his law was passed, and in the year after his consulship he was accused of aiming at royal power and was put to death (485 B. C.). G. L. H.

Vischer, fish'er, FRIEDRICH THEODOR: critic and poet; b. at Ludwigsburg, Würtemberg, June 30, 1807; studied theology and philosophy at Tübingen; was appointed Professor of German Literature and Æsthetics at Tübingen in 1837; traveled in Italy and Greece, where he studied art; was suspended from his professorship on account of his radical views on religion; was elected a member of the national assembly of Frankfort-on-the Main in 1848; accepted in 1855 a professorship at the polytechnical school of Zurich, and in 1866 was appointed Professor of Æsthetics and German Literature at the polytechnical school of Stuttgart. D. at Gmunden, Sept. 14, 1887. In 1837 Vischer published his *Ueber das Erhabene und Komische*, a preliminary study in the philosophy of the beautiful, in which he sketches the plan of the chief work of his life, the *Æsthetik oder Wissenschaft des Schönen* (4 vols., 1846–57). The first part of this classic, in which, on the basis of Hegel's philosophy, the metaphysics of the beautiful is given, must be considered antiquated; but the parts containing the discussion of the single arts of sculpture, painting, poetry, and music are unequaled for depth of thought, æsthetic insight, and suggestive criticisms. Vischer was the greatest German critic, after Lessing and Schiller, and many of his minor essays collected in *Kritische Gänge* (2 vols., 1846, with 5 vols. of new additions, 1860–66), *Altes und Neues* (1881–82), are

masterpieces of their kind. A great admirer of Goethe and his drama *Faust*, as shown by *Goethes Faust, Neue Beiträge zur Kritik des Gedichts* (1875), he was not blind to the deficiencies of the second part of the great drama, and ridiculed the extreme enthusiasts among the interpreters in his witty satire, *Faust, Der Tragœdie dritter Theil.* That Vischer was also a poet of great talent and exquisite humor is evident from his novel, *Auch Einer* (1879), and his collection of poems, *Lyrische Gänge* (1882). See Ilse Frapan, *Vischer-Erinnerungen* (1889); Julius Ernst v. Günthert, *Friedrich Theodor Vischer* (1889); Fr. Spielhagen, *Technik des Romans*, 101 ff; Victor Hehn, *Gedanken über Goethe*, 181 ff. JULIUS GOEBEL.

Vischer, PETER: sculptor and worker in bronze; b. at Nuremberg, Bavaria, in 1455; d. there Jan. 7, 1529. His father was a worker of reputation in bronze. Of his own life not much is known (see *Die Nürnberger Künstler, geschildert nach ihren Leben und Werken*, 1831), but he attained a great fame as an artist, and received orders from both German and foreign princes. Of his numerous works, the tomb of St. Sebaldus, in the Church of St. Sebaldus in Nuremberg, is the most celebrated (1506–19), containing seventy-two figures, besides those of the apostles and prophets. Other works only less celebrated are, in Römhild, the tomb of Count Hermann von Henneberg and his wife; three monuments in Bamberg to three bishops of the cathedral; in Hechingen, the tomb of Count Eitelfritz von Zollern and his wife; and especially two of the splendid statues which decorate the tomb of the Emperor Maximilian I. at Innsbruck. Revised by RUSSELL STURGIS.

Viscon'ti [from the Lat. *vicecomites*, viscounts]: an old Lombard family, said to descend from King Desiderius. Possessing large estates bordering on Lakes Como and Maggiore, it obtained, in course of time, the sovereignty of Milan, and extended its power over the whole of Northern Italy, from Venice to Florence. One member of the family, OTTONE, is mentioned in 1078 as Viscount of Milan, and another Ottone was appointed Archbishop of Milan in 1263 by Pope Urban IV. This appointment by the pope, and not by the chapter, was considered an infringement on the rights of the people, and occasioned a popular rising under the leadership of the family of the Torriani, or Della Torre. A civil war ensued, which was brought to an end in 1311, when the Emperor Henry VII. expelled the Torriani from the city, and confirmed MATTEO as Viscount of Milan, also making him imperial vicar in Lombardy. Between Matteo and Pope John XXII. a controversy arose regarding the appointment to the archiepiscopate of Milan, and Matteo was forced to resign a short time before his death. In 1322 the pope excommunicated the Viscontis, and in 1323 a crusade was preached against them, but by the aid of the Emperor Louis of Bavaria, GALEAZZO I. succeeded in completely defeating the holy army at Vavrio, on the Adda, in 1324, and in 1327 became imperial vicar of Milan. The power of the family now increased rapidly. Its members were conspicuous as shrewd politicians, able generals, and great patrons of literature and art; but they were generally unscrupulous and cruel, and conspiracies, depositions, and assassinations fill the pages of their history. With GIOVANNI GALEAZZO (1378–1402) the power of the family culminated. He was a son of GALEAZZO II., the patron of Petrarch, the founder of the University of Pavia, and the inventor of the famous process of torturing called Galeazzo's seat; and the son evinced all the father's virtues and vices on a grand scale. He founded the library at Pavia, re-established the university at Piacenza, founded the Cathedral of Milan, built the Certosa and the bridge across the Ticino at Pavia, etc. He conquered Padua, Verona, Vicenza, etc., bought the title of Duke of Milan from the Emperor Wenceslas, and aspired to the royal crown of Italy, when he suddenly died from the plague. His daughter, Valentina, married Louis, Duke of Orleans, and was the grandmother of Louis XII., King of France. On the death of his son, Filippo Maria, in 1447, the male line of the family became extinct, but his natural daughter, Bianca, married to Francesco Sforza, retained Milan and a large part of the family inheritance.
Revised by F. M. COLBY.

Visconti, ENNIO QUIRINO: archæologist; b. in Rome, Nov. 1, 1751. At an early age he became the conservator of the Capitoline Museum, and rose to the place of Minister of the Interior and of consul. At the approach of the Neapolitan army (1799) he went to Paris, where he was appointed director of the antiquities of the Louvre and Professor of Archæology. In this capacity he issued the celebrated *Catalogue* of the Museum (1801–03), and published the two works upon which his fame rests, the earlier having been instigated by Napoleon and published at his expense. The *Iconographie Grecque* was issued in three volumes in 1808, followed twelve years later by the *Iconographie Romaine*, also in three volumes. A collection of all his minor treatises was made by Labres (Milan, 1808). D. in Rome, Feb. 7, 1818. His son, LOUIS TULLIUS JOACHIM, b. in Rome, Feb. 11, 1791, studied at the School of Fine Arts in Paris, and was much employed as practical architect by Louis Philippe and Napoleon III. He erected in Paris the fountains of Gaillon, Molière, Louvois, and St. Sulpice, the tomb of Napoleon I. in the Hôtel des Invalides, and the Collet Palace on the Quai d'Orsay. He also furnished the plans for the completion of the Louvre, which, however, he did not live to see executed. D. in Paris, Dec. 1, 1853. ALFRED GUDEMAN.

Visconti-Venos'ta, EMILIO, Marquis: statesman; b. at Milan in 1829. He wrote for various literary and political periodicals, and was at first a supporter of Mazzini. In 1859 Cavour appointed him royal commissioner at the headquarters of Garibaldi in Lombardy, and he acted, in conjunction with the dictator Farini, in measures for the annexation of Central Italy to the kingdom of Sardinia. In 1860 he was associated with Pepoli in a mission to Paris and London, and after his return held office in the ministry of Foreign Affairs; accompanied Farini to Naples as legal and diplomatic counselor on the annexation of that kingdom to Italy; was three times Minister of Foreign Affairs, in 1863–64, 1866–67, and 1869–76. In 1886 he became a senator.

Viscos'ity [from Lat. *visco'sus*, sticky, viscous, deriv. of *vis'cum*, bird-lime; cf. Gr. ἰξός (for Ϝιξός)]: a term in physics denoting that property of matter in accordance with which the relative motion of its parts tends to diminish. It is exemplified in the dying away of sound and the gradual disappearance of the waves caused by an object thrown into water. The kinetic theory of gases gives us a simple explanation. If contiguous layers of gas are moving with different velocities, the diffusion of molecules across the space between them will tend to produce an equalization of velocity—that is, by increasing the velocity of the slower layer and diminishing the velocity of the swifter one. The viscosity is thus a diffusion of momentum, and may be measured by the rate at which the momentum is equalized across unit areas. If we cause a layer of gas to pass over another in parallel planes, the action of viscosity engenders a definite resistance. The same action takes place, but in a less degree, in liquids, and to a much smaller extent in solids. This property may be explained by Maxwell's theory of the constitution of bodies, according to which the difference between gases, liquids, and solids depends upon the readiness with which groups of molecules can be broken up. With every such breaking up of groups and assumption of new relative positions energy is expended and motion lost. Thus suppose that in the case of an elastic solid the mutual relations of groups of molecules are disturbed by stresses, then by the action of elasticity these relations are restored, but not perfectly, owing to viscosity. For instance, in the case of an oscillating tuning-fork, there is, independently of the resistance of the air, a tendency to the evanescence of motion in consequence of the deformation of the material itself. R. A. ROBERTS.

Viscount, vī'kount [originally a *vice-count*, or earl's deputy]: in the British peerage, the title of a nobleman higher in rank than a baron and lower than an earl. There is a corresponding title in the nobility of several other European nations. See NOBILITY.

Viscous Fermentation: See FERMENTATION.

Viscum: the genus of parasitic plants to which the MISTLETOE (*q. v.*) belongs.

Vishnu: the second person of the Hindu Trimūrti. While Brahmā is said to create, and Śiva to destroy, the chief function of Vishnu is said to be preservation. In tracing the history of the god, it can plainly be seen that the reason for nominating Vishnu as the Supreme Preserver lies in the fact that in his avatars he appears as an almighty Deliverer, the last succor of gods and men. If we are to believe his votaries he stands alone, as the incomparable chief of the Hindu pantheon. But, unfortunately, zealous advocates of Saivism are as extravagant in the praise of Śiva, their own deity, and declare that he is so potent that he is worshiped by Vishnu. As for Brahmā, he is rather a venerated name

that is encircled by shadowy awe, and which looms through the mists of tradition, than a living power to whom daily prayers and sacrifices must be offered up.

Vishnu is usually represented with four hands, and as riding on the Garuda, a being which is half bird and half man. He has 1,000 names. His wife is LAKSHMI (*q. v.*). The most remarkable thing about Vishnu as a god is his avatars or incarnations. Taking them in the order in which they are generally commented on, we come first to the incarnation in which Vishnu took the form of a fish. This is called the *Matsya avatār*. There are many indications that the history of this avatar has some connection with that of the Hebraic account of the Deluge. The origin of the avatar appears to have been the necessity for avenging the loss of the four *Vedas* which proceeded from Brahmā's four mouths. Brahmā, we are told, fell asleep, and a demon who saw him thus unconscious took the opportunity to steal the *Vedas*. The demon succeeded, but was caught in the act by Vishnu, who determined to slay him. He appears, however, to have taken a long time about it, and to have gone about his work in a very roundabout way. Vishnu took the form of a fish, and slipping into the hands of the sage Manu while he was performing his religious ablutions, addressed him and claimed protection from the larger fishes. Manu consented, and placed it in his pitcher of water. But the fish grew so large that he placed it in a pond. Then the pond was found too small, and the fish was placed in a lake. Then nothing but the sea would contain the enormous creature; whereupon Manu became convinced of the divine character of the fish, and after he had paid his adoration to the god, Vishnu revealed to him the imminence of a deluge which would destroy the world, and told him that a large vessel would appear to him, in which he was to embark, together with the seven Rishis, taking with him all the plants and all the seeds of created things. Manu obeyed the behest of the god, and when the water covered the face of the earth, Vishnu again appeared to him in the shape of a golden fish, with a single horn 10,000 miles long, and to this horn Manu attached the vessel, Vishnu's serpent serving as a cord. While thus floating in the vessel, Manu was instructed by the fish-god in the philosophical doctrines and the science of the Supreme Spirit; and after the deluge had subsided, the fish-god killed the demon, restored the *Vedas* to Brahmā, and taught them to the Manu Satyavrata.

Next comes the tortoise avatar. The gods becoming aware of their mortality, desired to discover some elixir by which they might become immortal. After solemn consultation they repaired to the omnipotent Vishnu, who directed them to churn the ocean of milk, with the mountain *Mandara* for their churning-stick. This was to be stuck down into the sea, cone downward, and the long serpent of Vishnu, *Vāsuki*, to be coiled round the mountain. The demons were to pull at the head of the snake, and the gods to pull at the tail, each alternately, so that the mountain should revolve in the sea of milk, and churn it. Vishnu himself, taking the form of a tortoise, descended to the bottom of the sea to support the mountain on his back while it revolved on the pivot of his scales. From the ocean thus churned was produced the desired amrita or ambrosia, and thirteen other things.

We now come to the *Varāha*, or boar avatar, in which Vishnu, taking the form of a boar, dived down to the bottom of the great ocean, and after a contest of 1,000 years rescued the earth which had been carried off by the demon Hiranyakasha. In the *Vāmana-avatāra*, Vishnu appears as a dwarf. The demon *Bali* was so powerful a monarch that he overcame *Indra* himself, and had gained possession of heaven, earth, and hell, and the gods knew not how to recover them. Vishnu appeared before him in the form of a dwarf, and did him reverence. Bali was pleased, and asked the little Brahman what he would like for a gift. The dwarf said, "Only as much ground as I can cover by taking three steps." This request was at once granted, when the god leapt up as the mightiest of the host of heaven, and placing one foot on earth, one on the middle space, and one over heaven, gained to himself the three worlds, leaving only hell to Bali.

In the next avatar Vishnu appears as a man-lion, and this incarnation is called *Narasinha-avatāra*. In it the Preserver is represented as saving the gods from the might, acquired by the most rigorous penances, of Hiran-ya-Ka'si-pu. He had forced from Brahmā the gift of a life which could not be destroyed by any created being. The moment he obtained this invulnerability, he began to molest the gods and to persecute the votaries of Vishnu. At length, Vishnu took upon himself to slay this demon without there being any need for Brahmā's vow being broken. He came, therefore, not in the form of a being which had been "created," but as a new creation, a man-lion, and tore the heart of the demon from out of his breast with his sharp claws.

In the *Parasu-Rāma* avatar of Vishnu is accomplished the liberation of the universe from Arjuna of the thousand arms, a man of the military class who, by deeds of unexampled piety, had acquired great power of malignancy, and Vishnu vowed to extirpate him and his whole caste. Using an axe or a bow he did this. It has been supposed that the legend is in essence historical, and records a great struggle in primeval times between Brahmans and Kshatriyas.

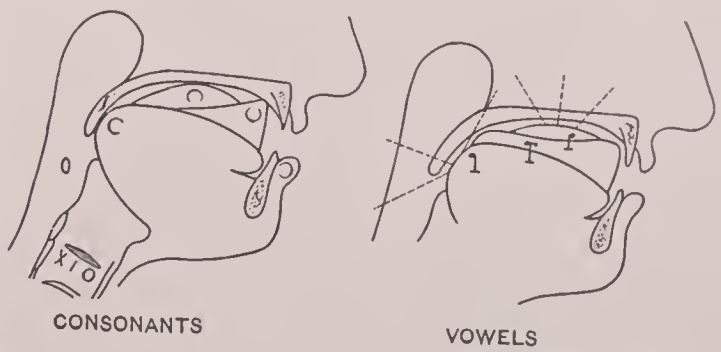
The avatar of Vishnu as Rama is given in full in the RAMĀYĀNA (*q. v.*).

The eighth avatar is that of Krishna (the most popular form of Vishnu), who first comes to earth as the opponent of *Kansa*, the fiend-king, who terrorized over gods and men. To annihilate Kansa, he, with Balarāma, determined to become incarnate. Kansa had news of this, and killed every child born as soon as he could. But by means of stratagems and concealment Balarāma and Krishna escaped and grew up, and after many pranks and wonderful deeds at length slew their great enemy Kansa, after having killed two of his pugilists before thought to be invincible.

The ninth avatar is that of Buddha. It is evidently a late invention of the Jains, who tried to reconcile Brahmanism with Buddhism. The last avatar is yet to come, when the great god with the four hands, and seated on a white horse, will descend and will destroy the universe. This is called the *Kalki* avatar. Revised by R. LILLEY.

Visible Speech: a system of symbols (devised by the writer of this article) in which every possible articulate utterance of the organs of speech is represented. In the ordinary writing of languages the letters which represent sounds have no relation to the mechanism of the sounds—unless, perhaps, in the single case of O, which may be held to be pictorial of the rounded aperture of the lips. Some letters have their distinctive parts low, as in d b; others high, as in q p; some to the left, as in e q d; others to the right, as in p b; but there is no organic significance attached to the variations. In the system of letters called visible speech every letter, as well as every part of every letter, is organically significant.

In a certain sense all writing may be called visible speech, because letters are the visible forms by which articulate sounds are conventionally expressed; but the title of this system conveys a very different idea. Speech consists of definite movements of the throat, the tongue, and the lips, and in different countries the same letters are associated with different sets of movements, or the same movements are associated with different sets of letters, so that one may know the letters perfectly in connection with one language, and yet be unable to pronounce them in any other language. Visible speech consists of writing which depicts the actual movements of the organs of speech in all their modes of action; and as the same organs are common to all men, and the effect of every action is the same in all mouths, the letters have a universal meaning, which is independent of differences of language or conventional associations. In this respect visible-speech letters resemble musical notes or arithmetical numbers. Like musical notes they have, everywhere, a uniform value in relation to sound; and, like the Arabic numerals, they have everywhere an absolute value in relation to meaning. For example, the symbol for the English sound of L directs the learner to "raise the point of the tongue against the palate and sound



the voice over the sides of the tongue"; and the symbol for the sound of M expresses to the eye the practical direction,

"close the lips and sound the voice through the nose." However variously these directions might be put in words in different languages, the effect of following the directions will, obviously, be the same in all mouths in every country.

The basis of the visible speech symbolism will be understood from the diagrams on the preceding page, the first of which refers to consonants, the second to vowels. All consonants are represented by *curves* which have the outline of the organs they symbolize. Thus:

C, back of tongue. U, point of tongue.
O, top of tongue. O, lips.

These curves all imply emission of compressed breath over the organ symbolized. Thus:

C, German *ach*. ω, English *r* in *road*.
Θ, English *y* in *yes*. Ɜ, German *w* in *wie*.

Five additional varieties of curves suffice to express all oral consonants. Thus:

C, mixed. C, shut.
C, divided. C, shut and nasal.
C, mixed divided.

Mixed curves denote that two parts of the mouth are simultaneously employed in forming the sound; as:

C, back of tongue and lips. Ω, top and point of tongue.
O, lips and back of tongue. U, point and top of tongue.

Divided curves show that the breath, instead of passing through a central channel, issues through side channels. Mixed divided curves show that, along with divided breath, two parts of the mouth are employed. Shut curves denote that the mouth-passage is closed by means of the organ symbolized. Shut and nasal curves show that, while the mouth-passage is closed, the breath escapes through the nose; as:

C, *ng*; U, *n*; Ɜ, *m*.

Voice is symbolized by a straight line. This, added within any curve, denotes the addition of vocality to the consonant action. The relation of *b* to *p* (Θ D), *d* to *t* (U O), *g* to *k* (C C), *v* to *f* (Ɜ Ɜ), *z* to *s* (U U) is in this way clearly indicated.

A straight line is the basis of all the vowel symbols (see diagram). A distinctive sign added on the left of the line denotes the back of the tongue; on the right of the line, the front of the tongue; and on both sides of the line, the middle of the tongue. Thus: l ʃ T. When the distinctive sign is at the top of the line it shows that the tongue is high, or near the palate; when at the bottom of the line, that the tongue is low, or farthest from the palate; and when at both ends of the line, that the tongue is in an intermediate position. Thus:

	Back.	Mixed.	Front.	
High	l	T	ʃ	(as in *eel*).
Mid	J	l	ʃ	(as in *ale*).
Low	J	I	l	(as in *ell*).

The vowels range themselves in pairs, the second of each pair being indefinite in quality as compared with the first: as in *eel*, *ill*; *pool*, *put*; *all*, *on*. The secondary vowels in these pairs are said to be of "wide" formation, because the cavity of the mouth behind the vowel aperture is expanded, so as to weaken the organic quality of the vowel. The "wide" vowels are uniformly distinguished by an open *hook*, instead of a solid point on the vowel-stem. Thus:

ʃ (ĭ), l (ă), J (ah).

Certain vowels are modified by the lips. These labialized vowels are uniformly denoted by a short line crossing the vowel-stem; as in ʇ (oo), ʃ (ü). The lips form three apertures, as in *ooze*, *old*, *all*; the first, or narrowest, is associated with "high" vowels; and the last, or broadest, with "low" vowels. Thus the vowel *oo* has the "high-back" position of the tongue, with narrow labial aperture; and the vowel *aw* (ʇ) has "low-back" position of the tongue, with broad labial aperture. The vowel *ō* (ʇ) is intermediate between *oo* and *aw*.

In this outline the aim has been to give the reader a general idea of the nature and capabilities of visible speech. The application of the system to the teaching of speech to deaf-mutes must be obvious to every one, even if experience had not demonstrated the fact. But the method is equally applicable to the teaching of foreign sounds to English and American learners, or to the teaching of English sounds to foreigners. The English language is advancing rapidly to universality, and the only impediment to its progress is found in the mode of writing it. If visible speech is used as a key to English sounds all initiatory difficulty will be removed.

In the meantime the symbols may very advantageously be used for the transcription of foreign words and proper names which so greatly perplex the reader in books of travel, etc. For this purpose a font of these physiological types would have to be added to the equipments of newspaper and book printing-offices.

Visible speech as a key to universal phonetics fulfills a function which has never before been possible. Objections have been urged against the employment of the system for the ordinary writing of languages, on the ground that the mechanism of familiar sounds, as embodied in the symbols, is not required to be constantly shown. This is true. After the local pronunciation of letters has been communicated by the visible-speech key, any established system of letters may be freely continued. For the representation of unwritten tongues, however, and for such languages as Chinese, Japanese, etc., the advantages of visible speech should only require to be known to be adopted.

The following works may be consulted for further details: *Sounds and their Relations*, a revision of the basis of visible speech; *Lectures on Phonetics*, delivered at Johns Hopkins University, Baltimore, and in Oxford University, England; *English Visible Speech in Twelve Lessons*, etc.

ALEXANDER MELVILLE BELL.

Visigoths: See GOTHS.

Vision [viâ O. Fr. from Lat. *vi'sio*, *visio'nis*, a seeing, deriv. of *vide're*, *vi'sum*, see; cf. WITNESS]: perception by the sense of sight. The organ of vision is the eye. The immediate cause of the perception in normal vision is found in the action of waves of light upon the terminal expansion of the optic nerve. The sensation conveyed to the brain by this nerve is highly specialized, different from the deliverance of any other nerve, and has thus far been found incapable of analysis. The existence of such sensation has to be accepted as an ultimate and inexplicable fact in nature.

Construction of the Organ of Vision.—The eye is a product of organic development, and, like all such products, it is by no means an ideally perfect instrument, even when quite free from such defects as are ordinarily recognizable. Optically it is a camera obscura with a very imperfect lens and a receiving-plate that is far from being uniformly sensitized, but with such ready mobility and capacity for quick adjustment that no artificial camera can be compared with it in general availability for practical use. In shape it is nearly spherical, resting on a fatty cushion within its bony socket. The outer covering of the eyeball is a tough, fibrous white tunic, known as the sclerotic coat. Upon its exterior are attached six muscles, which oppose each other by pairs. By means of these, motion can be given it about a vertical axis, a horizontal axis, and a slightly oblique axis. The front portion of the sclerotic forms the visible white of the eye. About the center of this is a portion slightly more protuberant than the rest, and quite transparent; it is known as the cornea.

Within the sclerotic is a second coat, the choroid, which is dark in tint and nearly covered with a network of blood-vessels and nerve filaments. Its continuation in front be-

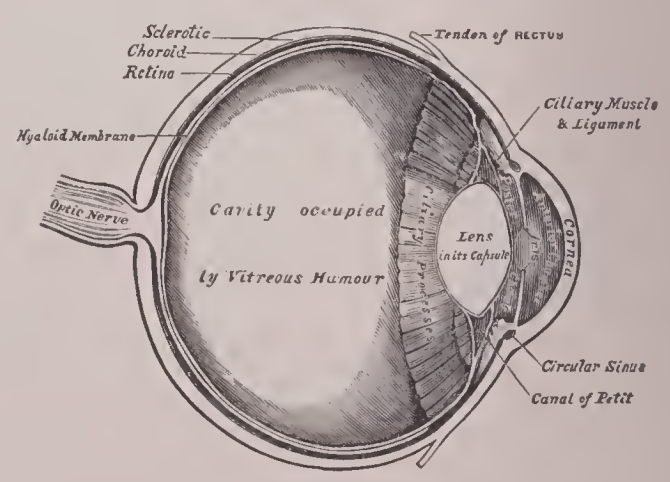


FIG. 1.—Vertical section of the eye.

neath the cornea is a colored curtain, the iris, perforated with a central opening, the pupil. This curtain is provided

with two sets of muscular fiber; one of these is ring-like and the other radial. By variation in the tension of these fibers the size of the pupillary opening is varied, and the quantity of light thus admitted to the eye is to a limited extent under control.

The space within the globular chamber is filled with transparent matter, which with the cornea makes up the converging optical system that serves the purpose of a lens. This matter is varied both in consistency and in density. Most of it is jelly-like, and receives the name of vitreous humor. The portion just behind the cornea is thin and mobile like water, and is hence called aqueous humor. Between the aqueous and vitreous humors is the crystalline lens. This is held in a light transparent capsule, and surrounded at the edges with the fibrous tissue of the ciliary muscle. It is made up of transparent layers which increase in density from surface to center. It is moreover elastic, so that its form is capable of modification by varying the contraction of the ciliary muscle. For further anatomical details, see EYE.

Optical Character of the Eye.—To bring rays of light to a focus it is necessary that the converging system shall be denser than the medium through which waves are propagated from the radiant source, and that one or both of two opposite surfaces shall be appropriately convex. The measure of density, optically considered, is the index of refraction. (See REFRACTION.) Assuming that of the air as unity, the refractive index of the aqueous humor has been found by Listing to be 1·338; of the vitreous humor, the same, and the mean index of the crystalline 1·455; these measurements being of course for the brightest part of a luminous spectrum, corresponding to the line of sodium light. (See SPECTRUM.) The optical density of the aqueous and vitreous humors is thus a trifle greater than that of water, while the density of the crystalline is less than that of ordinary crown glass. Assuming the thickness of the cornea to be uniform, so that it produces no effective deviation of light, but only determines the limiting surface of the aqueous humor within, the effect is sensibly the same as if the light should fall on a converging surface of water, then upon the denser crystalline immersed in this, and be brought to a focus in the water. The deviating effect depends jointly upon the density of the medium and the curvature of the refracting surfaces. The radius of curvature of the cornea, and therefore of the liquid surface which it bounds, is somewhat variable; a mean value is about 8 mm. The convexity of the rear surface of the crystalline is more abrupt than that of its front surface, its radius of curvature being 6 mm., while that of the latter is 10 mm. The interval between the front surfaces of cornea and crystalline is 4 mm., and the thickness of the crystalline about the same. Taking all these elements into consideration, the final effect is the same as if the light were focalized by a single lens whose optical center is a trifle in front of the rear surface of the crystalline, and whose focal length is 16 mm. (about $\frac{5}{8}$ths of an inch). The crossing-point of rays within the crystalline is called the nodal point.

If then a beam of homogeneous yellow light coming from a distant point should fall upon an eye of average dimensions, like that just described, and if there be no irregularities of structure in this, the back of the eye should be $\frac{5}{8}$ths of an inch behind the nodal point in order to receive a sharp image. If the distance be too small, the converging rays will be caught upon a definite area without being brought to a focus; if too great, they will cross and be diffused over a definite area on the surface beyond. Such areas are approximately circular, and are called diffusion circles. If the light radiates, not from a single point, but from a collection of these forming a surface, the image will also be a surface, which will be sharply or badly defined in proportion to the absence or presence of diffusion circles. From the elementary principles of refraction it is obvious that the image must be inverted, and that its linear dimensions must be as much less than those of the object as its distance from the nodal point is less than that of the object. That this is the case was proved theoretically by Kepler in 1604, and practically by the Jesuit Scheiner in 1625. The latter removed the sclerotic from the back of the eye of a recently killed animal, and through the thin residual membrane the inverted image was found to be visible. The same experiment was then successfully performed upon the human eye.

Accommodation of the Eye to Varying Distance.—From the elementary theory of lenses (see LENS), it follows that if a screen be properly placed to receive a sharp image of a distant luminous point, then if this point be brought near to the lens the screen must be moved farther back to maintain distinct focalization. A child with good normal vision secures a distinct image of an object only 3 or 4 inches in front of the face with apparently as much ease as when the object is remote. Sixty years afterward the same person finds it impossible to obtain distinct vision of an object a yard away without the aid of spectacles, although the distance from nodal point to retinal expansion of the optic nerve has changed but little, if at all. The eye therefore has some power of accommodation to varying distance, but this power diminishes with increasing age.

In the photographer's camera the distance between lens and sensitized plate may be varied at will. In the camera of the eye this is not possible. The passive condition of a normal eye is that of accommodation to an infinite distance, so that parallel rays are focalized as accurately as possible on the retina. If the object be at some finite distance, then theoretically the interval between nodal point and retina must be increased by a calculable amount. But practically the necessary rate of recession may be disregarded for distances in excess of 20 feet. For example, if we assume the focal length of the eye to be five-eighths of an inch and a luminous point to be brought up from infinity to a distance of 20 feet, then an application of the formula for lenses shows that the retinal screen would need to be moved back less than $\frac{1}{500}$th of an inch. If brought up from 20 feet to 1 inch, distinct focalization would require a backward movement of the screen through a little more than an inch. Since, however, no such motion is possible for the retinal screen, the practical effect is the production of diffusion circles, small enough to be disregarded in the first case, and in the second case so large as to make distinct vision impossible even for an infant. With change of distance, therefore, accommodation is possible only by corresponding change in the converging power of the ocular lens system.

Prior to the middle of the nineteenth century absolutely nothing was known regarding the mechanism of visual accommodation, but the subject had stimulated speculation to the utmost. Many denied completely the necessity for it and the existence of any variation in the refraction of the eye. Some maintained that the contraction of the pupil would suffice to produce approximate accommodation; others that it was due to variation in curvature of the cornea, to displacement of the crystalline, to change of form of the crystalline or of the eyeball. For the solution of the problem credit is due a number of investigators, but especially Langenbeck, Cramer, Helmholtz, Donders, and Knapp. Helmholtz in 1851 invented the ophthalmoscope, by which the interior of the living eye could be examined (see OPHTHALMOSCOPE), and shortly afterward the ophthalmometer, by which measurements are made upon the living cornea and the two surfaces of the crystalline without touching these bodies. As far back as 1837 the observation was made by Sanson, a French surgeon, that under appropriate conditions, if a light be held near the eye faint reflected images of it are formed by the front and rear surfaces of the crystalline, which thus serve as mirrors. Cramer and Helmholtz independently applied this method in the study of accommodation. They established the fact that, when the eye is changed from a passive condition to that of accommodation to secure distinct vision of a near object, the surface of the cornea remains unchanged, but the convexity of the front of the crystalline is increased, while that of its rear is but slightly affected. Helmholtz's explanation is that the lens is kept continually in a state of tension by its attachment to the encircling ciliary body. When the ciliary muscle contracts, the lens in virtue of its own elasticity becomes more convex than when the eye is passive. Its converging power is thus increased, and the adaptation for near objects is hence effected. During childhood the crystalline is comparatively soft, and it responds readily to variations of tension. With the lapse of time it gradually hardens so that during old age no effort of the ciliary muscle is sufficient to modify its form. The power of accommodation is then wholly lost, and increase of converging power is attained only by the use of convex spectacle glasses to aid the crystalline. The distance at which distinct vision is most comfortable for the normal eye is ordinarily assumed to be 10 inches. The selection of this distance is quite arbitrary. For a child of ten years the distance of the "near point" of distinct vision is about 3 inches; for a man of forty-five years, 12 inches; for one of eighty years, infinity. These estimates are applicable only to the normal eye.

The Retina.—This is the membranous expansion of the optic nerve spread over the inner surface of the choroid coat. The nerve itself extends from the base of the brain, and as a bundle of fibers inclosed in a protecting sheath it enters the eyeballs on the inner or nasal side of the middle of the sclerotic at the rear. From the end of this cable the fibers are spread out. Their terminals are connected, some with ganglionic cells and others with the minute rods and cones that compose the so-called bacillary layer. The length of one of these rods is about 0·07 mm., its thickness 0·0015 mm.; the cones are shorter, thicker, and flask-shaped. (An inch is barely more than 25 mm.) The rods and cones are packed together over nearly the entire surface of the retina, with their ends pointing toward the crystalline. This bacillary layer has been proved to be the part of the retina sensitive to light, while the fibers serve to convey the sensation to the brain.

On the outer or temporal side of the entrance of the optic nerve, about 3 mm. distant, is a small area which, on account of its color, is ordinarily named the yellow spot. At its center is a minute depression, less than 1 mm. wide, called the *fovea centralis.* Within this pit the rods are absent, but the cones are crowded together and reduced in diameter, and no blood-vessel enters. This pit is remarkable on several accounts; through it passes the optical axis of the lens system, and therefore upon it is focalized the image of any single bright point to which the attention is directed. Here it is that the most exact discrimination of distances is made, and here the sensitiveness to color is a maximum, while the sensitiveness to light is less than in the surrounding neighborhood.* The sensitiveness to light reaches its maximum on the temporal side of the fovea about 8° or 10° away; and here it is many times as great as within the fovea. It then diminishes with increasing distance, vanishing near the equator of the eye. The limit of the ocular field of view is therefore vague. While the visual line passes from fovea through nodal point to some external "point of fixation," the attention may at the same time be given to other points in the neighborhood of the latter; but the perception of impressions produced by such indirect vision is wanting in definiteness. This is easily tested. Let a disk of red cardboard, a few inches in diameter, be held at arm's length and aligned with some object in front which may serve as a distant point of fixation. On moving the disk horizontally outward the perception of its color quickly becomes less vivid and of its outline vague. Its tint changes through brown to black, and it becomes invisible when the arm is pointed about 90° away from the constant visual line.

In marked contrast with the yellow spot is the end of the nerve cable where the optic nerve enters the eye. Since this is wholly fibrous and devoid of rods and cones, it is incapable of receiving luminous impressions. The blindness of this fibrous bundle is easily tested. Let the right eye be directed to the cross in the accompanying cut, while the left

Fig. 2.—Detection of the blind spot.

is closed, the line connecting the two pupils being parallel to the lines of print. Keeping the point of fixation constant, the white circle at the right is seen by indirect vision, but it disappears when the interval between eye and page is 7 or 8 inches. The angular diameter of this insensitive area on the spherical surface within the eye is nearly 8°, which corresponds to a linear diameter a little in excess of 2 mm.

Optical Faults of the Normal Eye.—The eye is very faulty if judged by the standards applied in the construction of optical instruments. Considering it as a camera, the receiving-plate of this should be uniformly sensitized, and its lens system should be free from errors of refraction. The retinal receiving-plate, with its large "blind spot," its cones sensitive to variations of color chiefly, its rods sensitive to variations in intensity of light, but this sensitiveness diminishing outward from the yellow spot and vanishing in marginal regions, comes far short of fulfilling the requisitions of optical science. The retinal blood-vessels, moreover, cover many of the rods and cones, and under appropriate conditions the shadows caused by them may be projected outward and made perceptible. Similarly, shadows may be outwardly projected due to fibers, streaks, and clots in the vitreous humor. If the head be thrown back and the gaze be directed upward toward a bright sky, these obstructions often float into the field of view, and flit from side to side with the motion of the eye.

In addition to these minor defects the material composing the cornea and crystalline lens is not uniformly clear, and their surfaces are not regular. When a strong light is used to examine these bodies they are found to be fluorescent (see Fluorescence), especially if blue or violet light be employed. Fibers and spots in the crystalline obstruct the light transmitted and partially scatter it. This lens is an aggregation of layers, whose fibers are arranged around six or more axes that render uniformity of structure impossible. A beam from a luminous point therefore is not accurately focalized to a point, but to a line, or group of intersecting lines, or an irregular small area. The stars on this account, though practically infinitely distant, appear not as points of light, but more or less radiated in form. The surface of a lens thus built up can only imperfectly approximate toward that of a mathematically regular curve. Measurements made on the surface of the cornea by means of the ophthalmometer have shown that irregularities here are even more conspicuous than on the crystalline, and that the axes of cornea and crystalline rarely ever quite coincide. These imperfections of structure necessitate a perceptible degree of astigmatism in nearly all eyes. (See Astigmatism). Light coming from a point nearer than that of distinct vision is hence projected on the retina, not as a diffusion circle, but as a surface with irregular outline, often roughly elliptic.

Artificial lenses are usually made of glass clearer and more nearly homogeneous than the media of the eye, and with surfaces whose curvature is spherical. With such a single lens it is impossible to bring a sheaf of parallel rays accurately to a single focus, for both spherical and chromatic aberration need to be corrected. (See Aberration.) By combining two or more lenses made of properly selected but different kinds of glass, both of these defects may be almost wholly corrected. The refracting media of the eye are provided with no arrangement for the correction of either spherical or chromatic aberration, and on this account, aside from all other defects, distinct vision is impossible.

These defects belong to all human eyes. The existence of several of them may be demonstrated by an easy experiment. A tube is provided, an inch or two in width, and 3 or 4 inches long, open at one end and closed at the other. Through the middle of the closed end a perfectly circular small perforation is made with a needle, and a bright white surface is looked at through this opening, extraneous light being excluded by having the open end of the tube next to the eye. The light from the perforation is collected upon the retina as an approximate diffusion circle; but its boundary is irregular, its area is mottled and its border is fringed with orange and red light. In most cases the general outline is roughly elliptic rather than circular. That the eye is not achromatic is further ascertained by regarding a window of stained glass transmitting various tints. The blue and violet parts will appear more remote than the red parts. The indices of refraction for the extremes of the spectrum being different, the accommodation of the eye has to be varied, and this produces the illusion of variation of distance.

The defects of the normal eye are usually not noticed, because test conditions are not involved in ordinary natural vision. What the eye ordinarily sees is that small part of the field of view upon which the attention is fixed. The defects pass unnoticed if attention is not specially drawn to them. Standards of comparison are needed in order to become aware of defects of any kind. Those of the eye are largely offset by its extraordinary capacity for rapid motion in its orbit. When any object is regarded we habitually direct the visual line to various parts of it in succession, and thus secure the best image of each that is possible under the circumstances. Every portion of it is thus quickly focalized on the most sensitive part of the retina. Variations of accommodation, moreover, are accomplished by the eye many times more quickly than is possible with any other optical instrument. The angular diameter of the

* Eugen Fick, *Studien über Licht- und Farbenempfindung* in *Pflügers Archiv*, vol. xliii., p. 441 (1888).

field of view, about 160° horizontally, and 120° vertically for each eye, is far in excess of that of any other instrument. While there is no approximation to theoretical perfection, its practical excellences are such that in comparison with them the defects of the normal eye are unimportant.

Sharpness of Vision.—Assuming an object at a standard distance and under standard illumination, the more this object can be reduced in size without loss of distinct vision, the keener is the sight of the observer. The standard of distance conventionally adopted is 20 feet. No more definite standard of illumination than ordinary diffuse daylight is generally employed; indeed the attainment of an available and practically invariable standard of illumination is exceedingly difficult. The absence of such standard explains the very diverse conclusions reached by competent authorities regarding the dimensions of the *minimum visibile*; for the apparent size of a small object, seen by the same eye under changing illumination, varies between very considerable limits. This process is called irradiation, and examples of it are abundant. If a post is aligned between the eye and the globe of an electric street-lamp, it appears much thinner where the bright light of the globe is seen on each side of it. If two small circles of the same size, one white on a black ground, the other black on a white ground, be brightly illuminated and viewed close together from a distance, the white circle will always appear the larger of the two. This follows naturally from what has been said about the fluorescence of the crystalline, the irregularities and numerous faint obstructions to light in it, and the general optical defects of the lens system. Each ray is more or less scattered before it reaches the retina, so that the bright focus is surrounded by a halo which is scarcely perceptible if the light be faint, but noticeable if it be intense. It is commonly assumed that for a normal eye one minute of arc measured on the *fovea centralis* corresponds to the smallest interval that can be distinguished between two bright points. Assuming the nodal point to be 15·7 mm. distant in front of the fovea, this angular interval corresponds to 0·0045 mm. Two points separated by the same angular interval a mile away in front of the eye would be rather more than 100,000 times as far apart, or about half a yard. If nearer together than this, they would appear as a single point. By applying this datum with the assumption that at least two rods or cones must be impressed at the same time in order to distinguish any interval, the limiting diameter of the rods and cones has been estimated. But such estimates are exceedingly uncertain, because so much depends upon intensity of illumination. For short distances and moderate illuminations, the assumption may be sufficiently near the truth for a working hypothesis, but it fails when applied to distant self-luminous points on a dark background. Very rarely can a person be found who is able with the unaided eye to distinguish the third and fourth moons of Jupiter. The nearer of these is five minutes distant from the planet, and the other about twice as far.

The assumption that one minute of arc is the measure of the *minimum visibile* has been applied by Snellen in the construction of letters and numerals, which are now universally employed as tests in measuring sharpness of vision. For examination the subject is placed 20 feet away in front of various sizes of test type well illuminated by diffuse daylight. The size of the smallest type that he can read correctly affords the means of expressing his sharpness of vision in comparison with that of the normal eye.

Remediable Defects of Vision.—Upon the tombstone of an Italian, Salvino Armati, who died in Venice in 1317, is an inscription in which he is designated as the inventor of eye-glasses. Not until 1604 was the correct theory of these given by Kepler, yet it is probably safe to say that during the last three or four centuries they have been generally used to supplement defective accommodation for the eyes of the aged. But only since the new era introduced by Cramer, Helmholtz, and Donders has it been possible to determine with accuracy the defects of abnormal eyes, and the steps to be taken for the correction of errors of refraction. The noteworthy increase in the use of eye-glasses during the present generation is not an indication that the conditions of modern life are specially damaging to eyesight, but only that defects of vision are now detected and corrected which were formerly unsuspected or deemed incapable of explanation or correction. After defective vision has been detected by the use of test type, it remains to determine the nature of the defects. The oculist tries upon the subject a variety of glasses, convex, concave, and cylindrical, of successively diminishing radii of curvature, to ascertain which of these, or what combination of them, effects the greatest improvement in vision. He is enabled thus to prepare a formula for each eye, in accordance with which an eyeglass may be specially ground to correct its defects.

The chief defects of vision are (1) near-sightedness or myopia, which may be remedied by the use of concave glasses of proper focal length. (2) Oversightedness or hyperopia, which may be remedied by the use of convex glasses of proper focal length. (3) Astigmatism, which is due chiefly to unequal curvature of the cornea in different planes, and may be regarded merely as hyperopia or myopia in a special plane. The remedy is to wear a convex cylindrical glass, whose radius of curvature is so adjusted as to collect the rays sufficiently in a vertical plane without affecting those in a horizontal plane. (4) Old-sightedness or presbyopia, which is due to the hardening and unequal shrinking of the crystalline which is developed during old age. The distance of the near point of distinct vision becomes inconveniently great, so that convex glasses are needed for vision of near objects, as in ordinary reading. This necessity is largely removed in the case of those who are naturally near-sighted; but for such persons concave glasses are still needed for vision of distant objects. For further details, see OPHTHALMOLOGY, SPECTACLES, and VISION, DEFECTS OF.

Visual Sensation.—Only a small part of the waves emitted by a source of radiant energy are capable of producing the sensation of light. The retina is insensible to many of those which affect the photographic plate, and equally so to those which produce heat. By placing an iodine cell in front of an electric lantern Tyndall* cut off the rays of light and converged those of heat to a focus. His eye was then put at this focus, with such precautions as to protect the external parts but transmit the concentrated beam of dark heat through the pupil to the retina. No damage was done, and no consciousness of heat was received through the optic nerve. Removing the eye, he substituted a sheet of platinum, which soon became red hot. Energy-waves longer than 0·00076 mm. or shorter than 0·00039 mm. thus fail to affect the retina. But within these limits, if sufficiently intense, radiant energy may be destructive. Plateau lost his eyesight through the inflammation produced by looking directly at the sun.

The sensation of light may be produced by other agencies besides radiant energy. An electrical current, even when very weak, produces the subjective sensation of a flash of light when passed through the eye. A blow upon the eye causes the recipient to "see stars." Poison in the system, such as may be due to excessive use of alcohol or opium, or mere fever, may induce the sensation of spectral images that are as real to the sufferer as if occasioned by external agency. Pressure upon the eyeball produces "phosphenes," visions of successively changing color that may last for several minutes. If the gaze be fixed for half a minute upon any object that is sharply defined and well lighted, then on changing the direction of the visual line a complementary "after-image" comes into view and may continue visible through some seconds, even in absolute darkness. Whatever is capable of exciting the optic nerve can produce the impression of light; and radiant energy of special wave-length is only one of many such agencies. But the optic nerve is the only one which this special mode of energy seems capable of exciting.

Upon the rods and more especially the cones of the retina of a normal eye the quality of sensation varies with the wave-length. The longest light-waves produce the sensation recognized as red, and from this the passage through orange, yellow, green, blue, and violet brings us to a limit of invisibility. (For details on this topic, see COLOR and COLOR-BLINDNESS.) The passage from one tint to another is quite imperceptible, but it is easy to specify three or four as specially prominent, and these have been called primary colors. Regarded from the standpoint of the artist, light was thought by Brewster † to be resolvable into three primary colors, red, yellow, and blue. From pigments of these three tints all other necessary tints may be produced by mixture, though deficient in brightness; but the mixture of red, yellow, and blue lights can not produce white. Young ‡ had previously selected red, green, and violet; for by mixture of these lights white can be produced. He supposed that in the retina are three kinds of nerve-

* Rede lecture on *Radiation* (Cambridge, 1865).
† *A Treatise on Optics* (Edinburgh, 1831).
‡ *Lectures on Natural Philosophy* (London, 1807).

fibers. The first of these are excited most by light-waves of greatest length, red, and in less degree by those of shorter period. The second are in like manner most sensitive to waves of green light and less to those of red and violet. The third are most sensitive to the shorter waves of violet light, and less to those of green and red. When all are simultaneously excited the resultant sensation is that of white. If one of these sets of nerves be wanting or deficient in sensitiveness the result is partial color-blindness. This theory, long forgotten, was revived by Helmholtz,* and with slight modification is now quite generally accepted by physicists. Among physiologists some adhesion seems to be given to a theory more recently advanced by Hering,† who regards white and black as primary color-sensations, to which he adds two complementary pairs, red and green, yellow and blue. To secure satisfactory objective proof of this, or indeed of any other theory of color-sensation, is difficult. The subject is fruitful of speculation rather than demonstration.

Visual Perception.—From the time that Kepler demonstrated the inversion of the retinal image of external objects, it became a troublesome source of debate to explain why we do not see all objects inverted. Accepting the fact, Brewster ‡ formulated what he called the law of visible direction, claiming that "the line of visible direction does not depend upon the direction of the ray, but is always perpendicular to the retina." The mathematical relation implied in this statement was disproved by Ferrel,‖ but it is in accord with all human experience to refer the source of an impression to the direction from which it comes. The line of visible direction is determined by the direction of the ray entering the eye. We are wholly unconscious of the inverted retinal image. The perception is mental; the thing perceived is the object; and the retinal image, reversed both vertically and laterally, is an intermediate step in a process that in no way rises into consciousness. Whether personal experience has any influence in determining the perception, or whether it is the outcome of intuition, is a question on which there has been much hot debate, and which, if satisfactorily answered at all, can be determined only by cumulative evidence. The object perceived occupies an external position in space, and the perception is one of locality as well as form. The theory of intuition assumes that the conception of locality is innate, and that impressions from external points are automatically transmitted to corresponding points on the retina. The empirical theory assumes that our sensations give us only signs of external objects, and that we learn to interpret these signs only by experience and practice.

Binocular Vision.—The contrast between the two theories of visual perception is yet more brought out by the special characteristics of single vision with two eyes. So long as we are dealing with but two dimensions in space, and considering surfaces like the retina which have length and breadth but no appreciable depth, there is perhaps little ground for choice between the two theories. We may admit a fundamental correspondence between certain retinal points and external points, or that the point of intersection of the visual line with the retina may be regarded as corresponding with every point along the direction of that line. But in looking with two eyes at the same object two retinal images of it are formed; yet ordinarily we do not see double. To explain this it is assumed on the intuitional theory that every point on the one retina has its corresponding point on the other, these corresponding points being so related that when simultaneously impressed they transmit but a single impression to the brain. In support of this view the fact is cited that the optic nerves of the two eyes cross before reaching the brain; and there is good reason for the belief that nerve-fibers from the right half of each retina extend together to the right hemisphere of the brain, and from the left halves to the left hemisphere. But there is no anatomical proof that fibers from corresponding retinal points are brought thus together by pairs.

According to the empirical theory there is no necessary and invariable correspondence between retinal points, but the subjective "sign," whether simple or complex, is recognized by experience as the index of that which has produced it. This implies no analysis of phenomena, no consciousness of retinal images, whether erect or inverted, whether in one eye or both eyes. The visual education by which this interpretation of signs is acquired begins from the hour of birth. A new-born infant gives no evidence of knowing how to direct its eyes or interpret what it sees, but the sense of touch is conjoined with that of sight in the unconscious education of the eye; and this education is acquired with exceeding rapidity. The co-ordination of impressions, the correction of illusions by conjoint application of different senses, goes on throughout life; but the capacity to acquire and to modify habit is incomparably greatest in infancy, and learning how to see is probably one of the earliest of all acquisitions.

The intuitional and empirical theories are not quite mutually exclusive. Man is a product of development. There is no sharp division-line between automatic and volitional actions, between instinct and reason, between the outcome of inheritance and that of habit. Whatever may be the inherited tendency to special modes of action, we may be quite sure that there is acquired very early in infancy the habit of associating mentally together the impressions produced by a single external object upon parts of the two retinas which, according to the intuitional theory, are called corresponding. The two retinal points of focalization of the same external point may therefore be conveniently called corresponding points, with the reservation that this does not imply any necessary anatomical relation, and that they will not necessarily convey the same impression to the brain when binocular vision is had under abnormal conditions, but that they very generally do so under normal conditions.

It is particularly in the perception of the third dimension in space, that of solidity or depth, that binocular is superior to monocular vision. With a single eye it is quite possible to obtain definite perception of distance or depth in space. Advantage is taken of all those elements that are combined in representing perspective in a landscape painting. The relative position of the different objects in the field of view may be estimated in terms of some arbitrary standard if they are not aligned exactly with the eye. The most important of these elements may be enumerated as follows:

1. Near objects subtend larger visual angles than remote objects of the same size. The visual angle gives thus the means of estimating the distance of objects of known size.
2. Near objects are seen more distinctly than those which are remote. The illusion of distance may hence be produced by decreasing the brightness of the object viewed and rendering its outlines hazy.
3. Near objects that are almost aligned with those at a distance, partly cover them. Covering objects are judged nearer than those covered.
4. Familiarity with the dimensions of known objects when near enables us to compare them when remote, and thus judge their relative distance.
5. We may move from one standpoint to another and compare the new view with what is retained in memory of the previous one. The difference of direction thus attained is called parallax of motion. It contributes in a very important degree to the judgment of both distance and form.

All of these elements except the last may be applied in a picture, and are equally effective in monocular and binocular vision, especially when considerable distances are represented. Their sum may for convenience be called physical perspective. For distances in excess of a few hundred feet it makes little difference whether vision is monocular or binocular if the illumination is good. But if an object is quite near—for example, a few feet or inches away—a new element of exceeding importance is introduced when the vision is binocular. Each eye occupies a standpoint sensibly different from that of the other, and therefore the retinal pictures are different, but cover very nearly the same retinal areas. On the whole, the impression carried to the brain is that of a single object, but the right eye sees more of its right side, the left eye more of its left side, and both eyes equally see the side directly turned toward the observer's face, but at different angles. The view is much more comprehensive than is possible for a single eye, and the knowledge of the body's total form, especially of the relation between nearer and remoter parts of its surface, is much more thorough. But in this experiment there is no consciousness of the simultaneous use of two eyes. Subjectively the two are united into a single binocular eye, in which are combined the diverse impressions of two dissimilar retinal pictures. The distance of the object is so small that the elements of physical perspective are almost wholly excluded. The superior knowledge of form in tri-dimensional space,

* *Handbuch der Physiologischen Optik* (Heidelberg, 1866).
† *Zur Lehre vom Licht-Sinne* (Vienna, 1878).
‡ *A Treatise on Optics* (1831), chap. xxxv.
‖ *On Vision, Nashville Journal of Medicine and Surgery* (1855).

given under these circumstances, may be called binocular perspective. Most of our judgments of distance and form are due to the application of both physical and binocular perspective together.

It is easy to demonstrate that, when the two eyes are directed to a point on the nearer side of an object binocularly viewed so that its images fall on corresponding retinal points, the images of a point farther away can not fall on corresponding retinal points, and hence double vision must ensue. Let two pencils be held vertically in front of the face, one behind the other, with an interval of a few inches between them and a bright surface, such as a white wall, for a background. When the gaze is fixed upon the nearer pencil the farther one is by indirect vision seen double, so that the illusion is that of three pencils. Or, if the gaze is on the farther pencil, then the nearer one is seen double. The essential condition under which the binocular perception of depth in space is attained is that, while perfect fusion of retinal images is secured from points in one part of the tridimensional field of view, there shall be imperfect fusion of such images from points either more remote or less remote. This is most conveniently studied by use of the stereoscope (see STEREOSCOPE), for unless the eyes have received some training it is not usually easy to fix the attention upon such double images. The effect of this imperfect fusion is the perception of depth, but the existence of such duplication of images is usually not suspected. The observer is as unconscious of them as he is of the inversion of the retinal image. In studying them by means of the stereoscope the stereograph should consist of a pair of properly constructed outline drawings, from which the elements of physical perspective have been carefully excluded. It will then be found that, while duplication is perceived, the effect is to mar the binocular perspective unless the eyes are directed in rapid succession to different parts of the field of view. Fusion of images representing foreground and background is thus secured with quick alternation, and the gradation from perfect to imperfect fusion at any moment is imperceptible. Nevertheless, motion of the eyes is by no means indispensable, for the perception of binocular perspective has been repeatedly attained with only momentary illumination by the electric spark, lasting less than a thousandth of a second.

That the impressions on corresponding points of the two retinas are not necessarily always fused by the brain into a single sensation is shown by the phenomena of stereoscopic luster, discovered by Dove,* and of binocular combination of colored fields in the stereoscope. Let binocular combination of the two halves of the accompanying cut be attained by directing the right eye to the middle of the larger circle on the right, and the left eye to that on the left. This is easily done by looking through a pair of tubes. The right eye is impressed for the most part with a black field, the left eye with one that is white. The result is a lustrous appearance like that of graphite, rather than the uniform dull gray

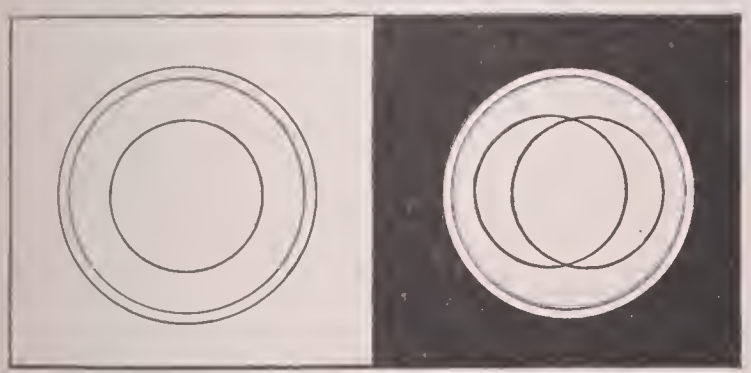


FIG. 3.—Binocular production of luster.

that would be the effect of mixture. One eye receives regularly reflected light and the other does not. The surface hence appears much brighter to one eye than the other, and the resulting appearance is that of lustrous polish imposed upon what alone would be dull. If the one field is bright red and the other greenish blue, the resultant impression carried to the brain is not gray, such as would be attained by mixture of lights, but retinal conflict of impressions. The field of view appears first of one color, then of the other, and while this alternation is going on each tint grows dull on account of retinal fatigue. Corresponding retinal points are simultaneously impressed without complete unification of the two sensations. In like manner stereoscopic relief may be produced without the production of double images that can possibly be traced as such. While performing the experiment for the development of luster there is binocular combination of the circles, of which there are two small ones on the right and one of the same size on the left. The latter is binocularly combined simultaneously with both of the former, so that the resultant impression is that of two circles in space, one nearer and the other farther than the plane of the paper. If such fusion were due to the unconscious perception of double images, we should admit that the same circle belongs to two opposite kinds of double image at the same moment. The effect is instantaneous, being attainable by use of the electric spark.

In conclusion, it may be said that the binocular union of dissimilar retinal images to produce a single sensation is a purely mental act, independent of anatomic structure. Corresponding retinal points are those which are usually impressed simultaneously, and which usually, but not invariably, carry to the brain sensations which are mentally united.

BIBLIOGRAPHY.—The most important treatise on vision is Helmholtz's *Handbuch der Physiologischen Optik* (1866; rev. ed. 1894). It contains nearly all that is at present known on the subject, apart from its applications to medical and surgical science.

A mere list of those who have written on vision would cover several pages. A few of the more prominent in Europe have been: Maurolycus, 1575; Baptista Porta, 1583; Kepler, 1604–09; Aguilonius, 1613; Scheiner, 1619; de la Hire, 1709; Berkeley, 1709; R. Smith, 1738; Porterfield, 1759; Thomas Young, 1801–09; Purkinje, 1819–25; Johann Muller, 1826–37; Volkmann, 1836–66; Brücke, 1841–66; Listing, 1845–51; Donders, 1847–66; Wheatstone, 1838–52; Brewster, 1849–56; Cramer, 1853–55; Knapp, 1860; Fechner, 1838–64; Meissner, 1854–56; Du Bois-Reymond, 1848; Dove, 1846–70; Wundt, 1859–80; Claudet, 1856–58; Hering, 1859–90; Giraud Teulon, 1861; A. von Graefe, 1856–65; E. Javal, 1865–94; and A. König, 1885–95.

Among American writers, aside from those who have treated of ophthalmic surgery, may be mentioned Joseph Le Conte, whose popular treatise on *Sight* was published in 1881. Many articles have been published, chiefly in the *American Journal of Science*, by W. B. Rogers, E. Emerson, O. N. Rood, J. Le Conte, W. Ferrel, A. M. Mayer, C. F. Himes, W. Le Conte Stevens, E. L. Nichols, C. Ladd Franklin, G. Stanley Hall, and E. S. Ferry. W. LE CONTE STEVENS.

Vision, Defects of: These are due either to (1) errors of refraction; (2) opacities of the refracting media; (3) lesions of the optic nerve, retina, or choroid; (4) continued exclusion of the eye from the visual act; or (5) affections of the visual centers in the brain, which may be acquired or congenital.

(1) When the refraction of the eye is in its normal condition, the eye is said to be *emmetropic*; i. e. the principal focus lies on the retina, the length of the visual axis corresponds exactly with the focal length of the dioptric apparatus when at rest, and the eye is adapted to bring parallel rays to a focus on the retina. When these conditions are not fulfilled the eye is said to be *ametropic*. Ametropia is of three kinds: (*a*) The refractive power of the eye is too weak, or the axis is too short, so that the principal focus of the eye falls beyond the retina. This condition is called *hypermetropia*, or far-sightedness. (*b*) The refractive power of the eye is too strong, or the axis of the eye is too long, causing the principal focus to fall in front of the retina. This condition is called *myopia*, or near-sightedness. (*c*) The refractive condition of the eye is such that a luminous point, e. g. a star, forms an image on the retina, the shape of which image is a line, an oval, or a circle, according to the situation of the retina, but never a point. This condition is termed *astigmatism*. Usually the seat of astigmatism is in the cornea, and is due to the fact that the cornea is more curved in one meridian than in another. The astigmatism may be *regular*, when the meridians of the cornea progress evenly in their refraction from the lowest to the highest, or *irregular*, when the curvature in different parts of the same meridian varies. In regular astigmatism one principal meridian may be emmetropic and the other ametropic (hypermetropic or myopic). This is *simple astigmatism*. Again, both meridians may be ametropic (hypermetropic or myopic), one being more ametropic than the other, but of the same character. This is *com-*

* *Ueber die Ursache des Glanzes und der Irradiation, abgeleitet aus chromatischen Versuchen mit dem Stereoskop*, in Poggendorff's *Annalen*, lxxxiii., 169 (1850).

pound astigmatism. Finally, one principal meridian may be hypermetropic and the other myopic. This is *mixed astigmatism.*

In moderate degrees of ametropia, and with the coats of the eyeball in a healthy condition, the normal standard of vision may always be reached by the prescription of suitable glasses—convex glasses for hypermetropia, concave for myopia, and cylindrical glasses for astigmatism. When there are very high degrees of ametropia, it is not always possible to give the patient full acuity or sharpness of vision even with proper correcting lenses. Very often high degrees of myopia and astigmatism are accompanied with serious changes in the coats of the eyeball which interfere with vision, and make it impossible to reach a full standard of vision with the glasses. It is difficult and often impossible to correct accurately with glasses those defects of vision arising from irregular astigmatism. It is important to correct refractive defects, particularly astigmatism, especially in early life, so that the retina may be properly educated by receiving accurate images of external objects, and to avoid the consequences of eye-strain.

(2) Serious defects of sight may arise from opacities of the cornea, so slight that they can be perceived only by the aid of the ophthalmoscope or of a powerful convex lens. Again, the cornea may be entirely white and opaque, owing to former ulceration, and thus reduce the vision to a bare perception of light. Where the pupil is covered with opaque cornea and another part of the cornea is transparent, vision is often in a great measure restored by making an artificial pupil immediately behind the clear portion of the cornea. Opacities of the crystalline lens and its capsule constitute CATARACT (*q. v.*), a condition which seriously interferes with sight. Occasionally the pupil is covered by the unabsorbed remains of the so-called pupillary membrane, which is a structure of fœtal life. The pupil may also be occluded by a deposition of inflammatory material which has resulted from an inflammation of the iris or of the ciliary body. Opacities of the vitreous may be due to hæmorrhage from the retinal or choroidal vessels, and the consequent mingling of blood with the vitreous humor, or to inflammatory or degenerative changes in the humor itself. Sometimes the vitreous contains numerous brilliant crystals of cholesterine, presenting a brilliant ophthalmoscopic picture, like a shower of sparkling meteors.

(3) Inflammation or atrophy of the optic nerve, or of either of the coats forming the back wall of the eye, separation of the retina from the choroid, tumors of the choroid and retina, hæmorrhages into the substance of the retina, and a great variety of inflammatory and degenerative changes in these structures—all produce grave defects of vision, and can be diagnosticated only by means of the ophthalmoscope.

(4) In cases of squint of one eye, either convergent or divergent, the image of the object formed upon the retina of the deviating eye is often involuntarily suppressed or disregarded. Thus the eye is excluded from vision and gradually loses the power of performing its function, as would be the case with any other unused organ. (See SQUINTING.) Sometimes vision can be improved in eyes of this character by restoring the visual axis to parallelism by an operation after correction of the refractive defect. Very often, however, no such improvement occurs. Again, especially in young people, when one eye is very ametropic and the other one nearly normal, the defective vision of the affected eye may sometimes be improved by excluding the good eye from sight, and forcing the imperfect organ to perform visual functions. Curiously enough, defective vision of one eye may often exist for years without knowledge on the part of the patient. The defective vision of a squinting eye often, and perhaps usually, depends upon imperfect development of the visual centers, i. e. the amblyopia causes the squint.

(5) In certain diseases of the brain the centers which preside over vision are affected. The lesion may be of such character as to cause complete blindness of one or both eyes, or it may be so situated that it causes the remarkable condition of half-blindness, or *hemianopsia.* Under these circumstances one-half of each field of vision is obliterated. It may be that corresponding halves of the retina lose their functions, and the equivalent portions of the field of vision are darkened. Thus if the left half of each retina is paralyzed, the right half of each field of vision will be lost. Again, the lesion in the brain may press upon a point which causes loss of function of the left half of one retina and the right half of the other retina. This will make both of the temporal fields of vision dark. A lesion in the brain which presses on the optic chiasm at the base of the brain would cause this condition. A lesion which pressed upon any portion of the visual tract in the brain back of the optic chiasm, that is the parts which are called the optic tracts, the optic radiations, and the occipital lopes of the brain, would cause the other type of half-blindness. Practically, a condition of this kind is incurable, although in rare instances recovery has come about. G. E. DE SCHWEINITZ.

Visitation and Search: a war right, the theory of and limitations upon which are explained under *Search* in the article INTERNATIONAL LAW (*q. v.*). Some details of the way in which it is exercised are here added. Although confessedly necessary for the enforcement of a belligerent's war rights upon the sea, search is at best a serious interruption and annoyance to neutral commerce, and should be exercised as mildly and reasonably as possible. Only ships bearing a commission from the state have the right of search. There seems to be no valid distinction between visitation and search, the two being successive steps in a single act having as its sole object the discovery of the character of a ship and its cargo. In the absence of treaty regulation the usual method is to hoist a flag and fire a gun, which is equivalent to an order to the merchantman to heave to, the visiting ship doing the same at some little distance. An officer and boat's crew are then sent to make the examination. The chief points of interest are the nationality of the merchant-ship, her real destination, and the character of her cargo. These facts will all appear from her papers, her register, sea-letter, log-book, charter-party, invoices, and bills of lading. If these are regular and no ground for suspicion appears, she should be allowed to proceed; but if otherwise, an actual examination of the facts in the case may follow. All of this must be submitted to under penalty of capture. Many treaties, however, attempt to lay down exactly how a visit shall be made, at what distance the visiting ship shall lie, and so on. The U. S. has a dozen or so of these, nearly all with the smaller powers. These reciprocally provide that the searching ship shall remain at "a convenient distance" or "out of cannon-shot," or at the greatest distance compatible with the state of wind and weather; that only two or three men shall accompany the visiting officer; and that the examination shall be conducted with as little annoyance and disturbance as possible. Of course, the absence of ship's papers, carrying false papers, or, as has sometimes happened, their attempted destruction, are very suspicious circumstances, and will warrant arrest. A previous bad reputation will naturally direct suspicion to a ship; but constructive or probable guilt should not be too much relied on. During the civil war in the U. S. the U. S. cruisers had a number of ships blacklisted, and apparently were ready to send any ship on this list in for adjudication, though some were probably free from guilt. At all events, previous wrongdoing is wiped out by the completion of a round trip, and a ship has a right to be judged on its present merits after that. An improper exercise of the right of search founds a claim for damages against the cruiser's government. See also CONVOY and SLAVE-TRADE. THEODORE S. WOOLSEY.

Visitation Nuns: a religious order first established in 1610 at Annecy, Savoy, by St. Francis de Sales and St. Jane Frances de Chantal; received papal approbation in 1626; introduced into the U. S. in 1808 by Teresa Lalor. The order has numerous convents in the U. S. and in Europe.

Vis'tula (Pol. *Wisła*; Germ. *Weichsel*): a river of Central Europe and the principal river of Poland. It rises in the Yablunka Mountains, in Austrian Silesia, 3,600 feet above sea-level, traverses Galicia, Russian Poland, and Prussia, and enters the Baltic Sea by several mouths. The main stream divides into two branches, which flow into the Gulf of Dantzic (Pol. *Gdańsk*) at Weichselmünde and the Frisches Haff respectively. The entire length of the Vistula is 650 miles, and it is navigable at Cracow for small vessels, and after it is joined by the San for large vessels. Its principal tributaries on the right are the Dunajec, San, Wieprz, Bug, and Drewenz, on the left the Pilica and Brahe. It is connected on the W. by the Bromberger Canal with the Oder, and on the E. with the Dnieper and the Niemen. The Vistula is the great artery of extensive trade for Austrian, Russian, and Prussian Poland, passing the large commercial cities of Cracow, Sandomierz, Warsaw, Modlin, Plock, Thorn, Kulm, Graudenz, Marienburg, and Dantzic. See Kalbus and Brandstäter, *Die Weichsel von ihrem Ursprung bis zu ihrer Mündung* (Dantzic, 1852). HERMANN SCHOENFELD.

Vita'ceæ: another name for the *Ampelideæ* or VINE FAMILY (*q. v.*).

Vitalis: See SJÖBERG.

Vita'lis Orderi'cus: historian; b. at Atcham, Shropshire, England, in 1075; educated in Normandy, where at an early age he entered the monastery of St. Evroul. Little is known of his life except that despite the strict rules of the order he managed to revisit England twice and to travel in France. D. about 1143, leaving the *Historia Ecclesiastica*, a Latin chronicle of ecclesiastical history from the birth of Christ to the year 1141. One portion of the work is devoted to the annals of the monastery of St. Evroul, but the greatest historical value attaches to the part that deals with the history of Western Christendom from the Carolingian period to his own time, especially to his descriptions of the social condition of France and England. See A. Le Prévost's edition of *Historia* (1838–55). There is an English version of Guizot's translation in Bohn's *Antiquarian Library*.

Vital Statistics [*vital* is from Lat. *vita'lis*, pertaining to life, deriv. of *vi'ta*, life]: a term sometimes defined as "the science of numbers applied to the life-history of communities and nations," or as "statistical ratios relating to the average course of life," but used in this article in the restricted sense of "statistics of deaths, births, and marriages." Reference is also made in the article to the statistics of disease; the statistics of more or less permanent mental or physical disabilities, such as insanity, idiocy, deaf-mutism, etc., however, are excluded.

Conclusions of Vital Statistics.—The data of vital statistics are derived from the records of individuals, but the conclusions relate to groups of people, and their scientific value consists in the results obtained by comparison of the conclusions derived from different groups living under different circumstances, with reference to determining the influence which these circumstances, taken singly or in groups, may have upon the life of communities. The conclusions of vital statistics are therefore expressions of probabilities with regard to masses of men and not with regard to individuals. These conclusions are for the most part given in the form of ratios, such as death-rates, birth-rates, or marriage-rates; and it is a matter of fundamental importance that these rates should be derived from corresponding figures of results, and of the causes presumed to have been those chiefly efficient in producing these results. For example, the number of births in a given place during a given time should be compared with the number of women of child-bearing ages—that is, between fifteen and fifty years of age—in that place, in order to obtain a scientific birth-rate—that is, one which can be fairly compared with the corresponding rate for another locality or for the same locality at another time. The birth-rate commonly given is that derived from a comparison of the number of births with the total population, and is of little interest.

Calculation of Mortality.—The unit of quantity used in vital statistics is one year of life, and the ratios are usually given as per 1,000 of population, which means per 1,000 years of life. Mortality means death-rate, not number of deaths, as natality means birth-rate, in the sense in which these words are used in this article. The gross mortality of a place is found therefore by multiplying the number of deaths occurring in it during a given time by 1,000, and dividing the product by the amount of life in that place during that time expressed in years of life. If the time was one year, the number of deaths 12, and the mean population for the year 600, then (the number of years of life being the same as that of the population, i. e. 600), the mortality ($12 \times 1{,}000 \div 600$) was 20 per 1,000. With a mean population of 12,000 and number of deaths during one month (calling a month $\frac{1}{12}$th of a year) 15, the number of years of life during this period was 1,000, and the death-rate was therefore 15 per 1,000. In general, if the time for which birth, death, or marriage rates are to be calculated is less or greater than a year, the result must be reduced to an annual ratio. Thus if the calculation be for one week, the result must be multiplied by 52·177, the number of weeks in a year, to give the annual rate. A more convenient and sufficiently accurate method in such a case is to divide the mean population for the year by 52 and to use the quotient as the divisor.

The essential data of vital statistics are derived from enumerations of living populations and from records of births, marriages, and deaths. The numbering of the people is effected by a CENSUS (*q. v.*). From the point of view of the vital statistician it is important that the results of a census shall be comparable in details with the results of the records of births, marriages, and deaths which are available for his work. The details which are of special importance are the unit of area, the age, the sex, the race, the marital condition, and the occupation. In the U. S. the units of area of the U. S. decennial census are the ward of a city, the city, the county, and the State. For the purposes of vital and medical statistics these units of area are often very unsatisfactory, because the boundaries of wards, cities, counties, and States are fixed with reference to political or sociological considerations rather than with reference to altitude, drainage, character of habitations or of the people, all of which are important factors in the causation of disease and death. Moreover, the political boundaries of wards and cities vary, often changing in the interval between two censuses, thus making it difficult or impossible to compare the results of one census with that of another, or, which is more important, to determine the mean population for any given period. As a census rarely occurs in the middle of the period for which it is desired to compute vital statistics, it is usually necessary to compute the mean population from the data furnished by two successive counts, upon the assumption that the population of a place increases according to the law of geometrical progression. To do this the first step is to ascertain the annual ratio of increase, which is done by the following formula: Let r = annual ratio of increase, p = population at last census, p' = population at next to last census, and n = number of years between these two censuses; then, using the logarithms of these numbers, $\log r = \frac{\log p - \log p'}{n}$. Having thus found the ratio, let x = the mean population sought, and m = the number of years between the time for which the population is sought and the last preceding census. If p is the population at the last census then $\log x = \log p + m \log r$.

The mean population for any period of time, as found by this geometrical progression formula, is rarely absolutely correct, since the rate of growth of a place is subject to many changes. If it were uniform the population found by the formula would be greater than the population actually living in the middle of the period, and less than the arithmetical mean of the populations at the beginning and end of the period; but if the period does not exceed two years the differences are so small that either figure may be used.

Estimates of population based on the number of voters, or of school children as found by a police census, or upon the data of city directories, are almost invariably in excess of the true figures, and whenever a city official uses these instead of the figures derivable from the U. S. or State censuses, it is safe to assume that the death-rates he obtains from them are considerably lower than the true rates.

The difficulties in the way of obtaining fairly reliable estimates of the mean population of a given locality for a given period, although often considerable, are small in comparison with the difficulties in ascertaining the mean number of persons of special age, sex, race, or occupation-groups living during such a period. If all the data for such purposes are furnished by each of two preceding censuses, the computations for each group may be made by the above formula—as for children under five years of age, for women between fifteen and fifty years of age, etc., for different units of area; but the sum of all these will not correspond to the sum obtained for the gross mean population, and there are special difficulties in ascertaining the mean population of children under one and under five years of age.

The number of births, deaths, and marriages occurring in a given population during a given time can be obtained with accuracy only by means of formal official registration of these events made at the time when they occur. It is utterly impossible to obtain by any system of enumeration or inquiry made at the end of a year records of more than 70 per cent. of the births and deaths which have occurred in any large group of population during the preceding year, and often not more than half of them can be thus ascertained. The only way to secure a complete registration of deaths is to forbid absolutely the burial or removal of dead human bodies without a permit for this purpose issued from a central office, which permit is issued only on the certificate of a person competent to state the cause of death, or as the result of a legal inquiry made by a coroner or special examiner. Most European countries have such a system, but it exists in but a few of the States composing the U. S., although it is carried out in most of the large cities.

Marriages.

The usual mode of stating marriage-rates is to give the number of marriages annually per 1,000 of living population, although the correct method would be to give the annual number of marriages per 1,000 of unmarried males and of unmarried females of marriageable ages. The following table shows the annual marriage-rates per 1,000 of living population for certain countries and States:

COUNTRY.	Average rate for 20 years, 1871–90.	1880.	1890.	1891.
England and Wales	15·6	14·9	15·5	15·6
Scotland	13·9	13·2	13·7	13·9
Ireland	9·0	7·8	8·9	9·2
France	15 4	14·9	14·0	15·0
Belgium	14·2	14·1	14·5	14·8
Prussia	16·7	15·3	16·4	16·3
Austria	16·3	15·3	15·1	15·4
Italy	15·6	13·9	14·7	15·0
Switzerland	14·7	13·7	14·1	14·3
Sweden	13·1	12·6	12·0	....
Massachusetts	*19·08	17·42	18·62	....
Rhode Island	†18·9	20·0	18·4	18·5

* Forty years, 1851–90. † Thirty-two years, 1860–91.

Birth-rate or Natality.

The following table gives the birth-rates per 1,000 of total population of several countries for the twenty years 1871–90, and for the years 1880, 1890, and 1891:

COUNTRY.	Average rate for 20 years, 1871–90.	1880.	1890.	1891.
England and Wales	34·0	34·2	30·2	31·4
Scotland	33·6	33·6	30·2	31·2
Ireland	24·9	24·7	22·3	23·1
France	24·6	24·5	21·8	22·6
Belgium	31·0	31·1	28·7	29·6
Prussia	38·2	37·8	36·6	37·7
Austria	38·6	38·0	36·7	38·1
Italy	37·3	33·9	35·9	37·3
Switzerland	29·4	29·6	26·6	28·2
Sweden	29·8	29·4	28·0	....
Massachusetts	*26·5	24·8	25·8	28·1
Rhode Island	24·7	22·7	24·7	26·5

* Forty years, 1851–90.

In no part of the U. S. is there an accurate and complete registration of births, and the only means of obtaining an approximate estimate of the annual number of births in the whole country or in the great majority of the States is to take the number of children under one year of age reported as living at the date of the census, and add to this the number of children born during the preceding year who died during the year. Using this method we find that the birth-rate per 1,000 of total population in the U. S. was 31·4 in 1880 and 26·8 in 1890. The figures for the different States are shown by the following table:

STATES AND TERRITORIES.	Birth-rate per 1,000 of population, 1880.	Birth-rate per 1,000 of population, 1890.
Alabama	37·8	30·39
Arizona	19·3	24·94
Arkansas	42·7	33·79
California	23·7	19·41
Colorado	21·7	25·09
Connecticut	22·5	21·26
District of Columbia	30·7	23·06
Delaware	28·7	24·88
Florida	34·8	28·30
Georgia	37·3	30·31
Idaho	28·5	27·14
Illinois	31·2	29·59
Indiana	30·6	25·29
Iowa	31·3	26·15
Kansas	35·2	28·16
Kentucky	34·9	29·45
Louisiana	35·7	29·57
Maine	20·9	17·79
Maryland	31·6	25·87
Massachusetts	24·0	21·51
Michigan	28·0	24·80
Minnesota	33·8	29·94
Mississippi	38·2	30·10
Missouri	33·1	28·72
Montana	22·6	22·81
Nebraska	36·9	28·42
New Hampshire	19·1	18·37
New Jersey	27·5	25·16
New York	25·7	23·28
Nevada	22·2	16·35
New Mexico	33·6	34·08
North Carolina	37·2	29·90
North Dakota	*	36·86
Ohio	28·4	24·08
Oklahoma	....	26·69
Oregon	28·8	22·49
Pennsylvania	29·4	25 69
Rhode Island	24·6	22·38
South Carolina	38·1	31·07
South Dakota	*	32·75
Tennessee	38·0	30·60
Texas	41·3	31·26
Utah	41·9	31·20
Virginia	35·4	27·12
Vermont	22·1	18·51
Washington	29·7	23·54
Wisconsin	30·6	27·00
West Virginia	36·3	30·41
Wyoming	27·1	21·78

* Dakota, 1880, 33·4.

The true birth-rates are probably about 15 per cent. greater than those indicated by the above figures; that is, the birth-rate of the U. S. in 1880 was about 36 and in 1890 31 per 1,000 of total population. The birth-rates in other countries also diminished in the same decade, as will be seen by the following table:

COUNTRY.	BIRTH-RATE PER 1,000 OF POPULATION.	
	1880.	1890.
England and Wales	36·0	30·7
Scotland	33·6	30·3
Ireland	24·7	22·3
France	24·5	21·8
Belgium	31·1	28·7
German empire	37·6	35·7
Austria	38·0	36·7
Switzerland	29·6	26·6
Netherlands	35·5	32·9

The causes of this decrease in birth-rates are diminishing marriage-rates and an increasing tendency to voluntary avoidance of child-bearing on the part of married people. The general rule is that the birth-rate is a little more than twice as great as the marriage-rate, but to this there are many exceptions.

As explained above, birth-rates thus calculated are not satisfactory, and a much better form is shown in the following table, given by Jacques Bertillon, in the *Encyclopédie d'hygiène* (Paris, 1890), vol. i., p. 179:

NATALITY IN CERTAIN COUNTRIES OF EUROPE.

COUNTRY.	Period of observation.	ANNUAL BIRTH-RATE PER 1,000 WOMEN FROM 15 TO 50 YEARS OF AGE.					
		Total.		Legitimate.*		Illegitimate.*	
		Still-born included.	Still-born excluded.	Still-born included.	Still-born excluded.	Still-born included.	Still-born excluded.
France	1878–82	103	99	173	166	17·5	16·1
Alsace-Lorraine	"	138	133	264	255	19·9	18·9
Belgium	"	138	132	275	263	20·1	18·9
Holland	"	158	150	308	292	9·7	9·0
Italy	"	149	144	249	242	24·7	23·7
Switzerland	"	122	117	249	240	10·9	10·2
Germany	"	158	152	278	265	29·5	28·0
Prussia	"	159	152	282	271	25·8	24·4
Saxony	"	171	164	273	263	48·0	45·8
Bavaria	"	164	158	285	276	43·3	41·7
Würtemberg	"	169	163	300	290	30·1	28·9
Baden	"	149	144	275	266	22·4	21·6
Austria (excl. Hungary)	"	152	148	250	244	46·0	44·3
Finland	"	146	142	264	257	21·8	20·8
Sweden	"	121	118	245	239	22·1	21·3
Norway	"	136	131	283	274	20·2	19·2
Denmark	"	135	131	248	240	27·0	25·9

* In the above table the legitimate birth-rate is calculated by comparing the number of legitimate births with the number of married women between fifteen and fifty years of age, and the illegitimate birth-rate by comparing the number of illegitimate births with the number of unmarried women of the same age-group.

Deaths.

For reasons given above, the death-rate of the U. S. and of the great majority of the several States can not be accurately determined; but for the whole country it was about 18 per 1,000, both in 1880 and in 1890. During the year ending May 31, 1890, the general death-rate was, in Connecticut, 19·4; in Delaware, 18·5; in Massachusetts, 20·2; in New Hampshire, 18·8; in New Jersey, 21; in Rhode Island, 21·9 per 1,000 of population.

The following table shows the death-rates of certain countries per 1,000 of total population:

COUNTRY.	Average rate for 20 years, 1871–90.	1880.	1890.
England and Wales	20·3	20·5	20·2
Scotland	20·4	20·5	19·7
Ireland	18·0	19·8	18·2
France	22·8	22·8	22·6
Belgium	21·4	22·3	20·6
Prussia	25·6	25·5	24·1
Austria	30·6	29·8	29·4
Italy	28·6	30·8	26·4
Switzerland	22·1	21·9	20·9
Sweden	17·6	18·1	17·1

In England and Wales during the five years 1886–90, inclusive, the general death-rate was, for males 20, for females 17·8; the death-rate for children under 5 years of age was, for males 61·9, for females 52; for those from 5 to 9 years of age, 4·9 for both males and females; for those from 10 to 15 years of age, for males 2·8, for females 2·9; from 15 to 20 years, males 4·1, females 4·1; from 20 to 25, males 5·5, females 5·2; from 25 to 30, males 7·4, females 6·9; from 35 to 45, males 12, females 10·3; from 45 to 55, males 19·4, females 15; from 55 to 65, males 35·2, females 28·8; from 65 to 75, males 72·1, females 61·7; from 75 to 85, males 147·9, females 132·9; 85 and over, males 313·8, females 276·2.

The death-rate of males is greater than that of females, and the death-rates in infancy and in old age are vastly greater than those of persons between five and fifty-five years of age; hence the death-rate of a particular group of persons depends largely on the proportion of infants and old persons in that group. For example, the death-rate of the foreign-born population in any State or city in the U. S. is less than the death-rate of the natives, because the latter class includes a much greater proportion of children; while, if the rates be compared by age-groups, as under five, five to fifteen, fifteen to forty-five, etc., the death-rate in each group will usually be found to be higher among the foreign-born. The death-rate in the Western States and in newly settled regions is usually below the average, because of the comparatively large number of adults, who have low death-rates, found in such localities.

During the year ending May 31, 1890, in those States having a fairly complete system of registration of deaths, the gross death-rate was 20·38; for children under 5 years of age, 75·36; for those between 15 and 45 years of age, 9·39; for those between 45 and 65, 21·36; and for those 65 years of age and upward, 76·83 per 1,000 of population of the same ages.

The following table gives statistics for each of the twenty-eight cities in the U. S. having a population of 100,000 and upward on June 1, 1890:

CITIES.	DEATH-RATES PER 1,000; STILL-BIRTHS EXCLUDED.						
	Aggregate.	Age-groups.					
		Under 1 year.	Under 5 years.	Under 15 years.	15 to 45 years.	45 to 65 years.	65 years and over; excl. unknown.
Sum of 28 cities:							
Total	21·62	236·79	77·99	32·25	10·71	26·62	89·76
Males	23·16	257·37	83·30	34·38	11·75	29·93	93·95
Females	20·08	215·70	72·59	30·10	9·68	23·28	86·33
Allegheny.							
Total	18·17	171·56	60·51	26·08	8·72	21·04	91·36
Males	19·01	185·83	61·09	26·65	9·33	24·25	95·73
Females	17·33	157·44	59·90	25·51	8·11	17·87	87·75
Baltimore.							
White—Total	21·05	258·95	80·27	30·71	9·01	23·75	86·02
Males	22·18	277·94	85·14	32·93	9·71	25·65	83·15
Females	20·00	239·06	75·28	28·49	8·37	22·02	88·19
Colored—Total	32·94	544·20	171·78	64·24	14·96	29·95	104·14
Males	37·44	622·15	191·01	72·32	15·08	35·98	127·52
Females	29·50	472·95	153·73	57·08	14·89	24·93	92·44
Boston.							
Total	23·44	261·34	87·17	35·50	12·16	27·41	94·68
Males	24·55	283·05	93·39	37·88	12·96	28·95	97·95
Females	22·40	238·59	80·74	33·09	11·41	26·00	92·34
Brooklyn.							
Total	23·89	254·87	85·53	35·65	11·33	29·44	96·82
Males	25·74	277·03	92·19	38·14	12·72	22·74	96·45
Females	22·11	232·44	78·89	33·16	10·02	26·28	97·10
Buffalo.							
Total	18·38	217·67	63·27	26·58	8·11	22·84	82·86
Males	19·82	238·10	67·90	28·77	8·60	27·03	90·25
Females	16·91	196·18	58·50	24·37	7·59	18·65	76·51
Chicago.							
Total	19·05	212·66	69·92	31·27	8·88	22·55	77·21
Males	20·12	233·95	74·98	33·38	9·40	25·38	81·67
Females	17·92	190·72	64·75	29·15	8·31	19·32	73·25
Cincinnati.							
Total	21·00	199·23	76·40	30·70	10·27	25·10	82·05
Males	23·16	212·70	78·51	31·74	11·62	31·28	93·23
Females	18·93	185·63	74·23	29·65	9·00	19·42	72·74
Cleveland.							
Total	20·21	239·33	79·32	32·88	8·56	20·10	82·38
Males	21·60	269·05	86·06	35·52	9·38	22·64	82·71
Females	18·78	209·49	72·45	30·20	7·71	17·46	82·11
Denver.							
Total	23·00	255·52	89·66	42·41	13·86	25·22	87·51
Males	23·77	258·25	91·72	43·65	15·60	29·42	90·66
Females	21·97	252·69	87·57	41·19	11·37	19·34	84·53
Detroit.							
Total	18·70	213·30	70·32	30·20	8·04	17·87	75·73
Males	19·35	230·74	74·35	31·26	7·82	19·27	79·77
Females	18·06	196·14	66·25	29·13	8·23	16·43	72·25
Indianapolis.							
Total	17·32	190·08	61·79	23·79	10·13	16·15	82·87
Males	18·22	212·12	69·44	26·54	9·50	18·86	83·60
Females	16·43	166·49	53·61	21·03	10·72	13·26	82·18
Jersey City.							
Total	25·63	273·85	94·17	39·13	13·30	31·26	85·66
Males	27·96	304·43	104·34	42·93	14·70	33·77	95·13
Females	23·27	242·62	83·94	35·33	11·87	28·58	77·77
Kansas City.							
Total	17·30	219·92	78·43	32·57	8·88	17·62	73·39
Males	17·14	239·18	82·24	33·68	8·88	17·71	70·23
Females	17·48	199·71	74·52	31·45	8·87	17·50	76·85
Louisville.							
White—Total	18·16	180·38	60·43	22·78	9·66	22·42	84·69
Males	20·49	202·17	67·50	25·53	11·00	26·45	94·48
Females	15·91	157·93	52·98	19·99	8·37	18·62	76·22
Colored—Total	28·98	300·19	119·98	43·34	17·91	31·57	102·87
Males	29·37	286·79	114·71	43·12	19·10	33·70	85·44
Females	28·65	314·52	125·22	43·55	16·90	29·70	113·46
Milwaukee.							
Total	18·78	221·92	65·65	27·45	7·79	21·18	76·03
Males	19·97	247·60	70·24	29·12	8·23	20·98	84·97
Females	17·62	196·70	61·08	25·81	7·37	21·39	67·60
Minneapolis.							
Total	13·54	151·89	49·18	23·94	7·06	15·42	49·84
Males	13·59	163·37	52·95	25·41	6·41	18·20	53·45
Females	13·49	139·63	45·26	22·44	7·82	12·01	46·51
Newark.							
Total	27·40	317·36	104·77	42·48	12·93	30·86	94·00
Males	29·34	330·18	108·04	44·02	14·54	34·97	96·24
Females	25·55	303·96	101·44	40·93	11·41	26·94	92·23
New Orleans.							
White—Total	23·57	254·55	70·19	26·25	12·94	34·17	100·68
Males	27·98	291·82	80·52	29·84	15·81	46·17	111·11
Females	19·55	216·43	59·95	22·67	10·39	23·91	92·86
Colored—Total	33·65	334·11	90·03	35·40	21·39	41·08	146·82
Males	37·29	368·01	94·50	37·14	26·25	48·11	146·60
Females	30·71	300·31	85·49	33·72	17·82	35·44	146·96
New York.							
Total	26·45	279·35	96·79	40·01	13·50	36·12	105·39
Males	28·75	299·57	103·23	42·87	15·38	39·41	108·13
Females	24·21	258·43	90·29	37·14	11·70	32·82	103·15
Omaha.							
Total	9·43	116·84	34·86	15·61	4·96	11·56	67·53
Males	9·10	134·66	37·27	16·47	4·61	12·08	67·61
Females	9·88	99·16	32·32	14·70	5·47	10·81	67·45
Philadelphia.							
Total	21·29	230·13	75·95	30·63	10·38	23·71	89·01
Males	22·75	250·11	81·17	32·62	11·34	26·52	94·20
Females	19·90	209·77	70·62	28·62	9·47	21·14	85·10
Pittsburg.							
Total	20·13	188·43	73·74	31·35	9·78	21·91	87·59
Males	21·59	203·07	78·01	32·86	11·21	26·34	93·57
Females	18·55	172·68	69·22	29·81	8·15	17·06	82·55
Providence.							
Total	21·12	219·04	75·90	29·74	10·37	23·62	97·77
Males	22·24	234·25	82·31	31·36	11·62	24·76	101·21
Females	20·08	203·87	69·47	28·10	9·22	22·60	95·28
Rochester.							
Total	17·32	189·66	55·80	22·09	8·29	20·96	85·68
Males	18·82	208·19	60·15	23·92	9·16	23·41	90·95
Females	15·93	171·35	51·41	20·26	7·49	18·84	81·40
St. Louis.							
White—Total	16·50	179·78	53·27	21·86	8·47	23·35	76·40
Males	18·36	204·47	58·13	24·04	9·39	27·96	82·92
Females	14·60	154·24	48·29	19·67	7·53	18·33	70·54
Colored—Total	31·11	378·28	129·89	48·16	19·10	39·51	114·86
Males	33·37	365·67	129·92	49·46	21·71	40·50	170·51
Females	28·95	390·98	129·85	46·92	16·62	38·56	82·67
St. Paul.							
Total	14·88	161·70	56·40	26·97	6·66	15·56	57·95
Males	15·25	178·91	61·14	28·48	6·45	16·91	68·94
Females	14·47	144·91	51·63	25·45	6·90	13·97	47·52
San Francisco.							
Total	22·46	253·06	74·12	27·40	13·67	34·51	103·57
Males	25·19	261·17	76·50	28·49	16·15	40·85	112·15
Females	18·86	244·45	71·66	26·29	10·17	25·30	91·90
Washington.							
White—Total	18·57	208·71	65·04	23·90	9·35	23·28	79·37
Males	21·02	234·89	69·17	25·52	10·49	27·80	89·13
Females	16·23	182·82	60·77	22·26	8·33	18·35	70·41
Colored—Total	34·03	494·60	159·93	57·00	17·23	33·63	114·72
Males	37·84	529·26	171·96	60·10	18·94	38·83	134·66
Females	30·96	461·44	148·57	54·08	15·99	28·72	102·89

The gross death-rates of different localities may be made somewhat more fairly comparable by reducing the distribution of the several populations according to age-groups to one uniform standard, as is done in the reports of the registrar-general of England for the principal cities and towns, twelve age-groups being used for this purpose. Prof. Körösi proposes four age-groups for this purpose, viz., under 1, 1 to 20, 20 to 50, and 50 and upward, the standard to be under 1, 2·65 per cent.; 1 to 20, 39·81 per cent.; 20 to 50, 38·62 per cent.; 50 and over, 18·92 per cent. Taking the population of New York city as a standard, at the age-groups proposed by Körösi, the following table shows, for fifteen of the largest cities in the U. S., the gross and the corrected death-rates for the year ending May 31, 1890:

CITIES.	Gross death-rate.	Corrected death-rate.
Newark	29·04	29·13
New York	28·63	28·63
New Orleans	28·40	28·88
Jersey City	27·51	27·56
Washington	25·85	26·96
Brooklyn	25·54	25·39
Boston	24·79	25·39
Baltimore	24·75	24·91
Denver	24·21	26·69
San Francisco	23·61	25·39
Philadelphia	22·67	22·53
Cincinnati	22·36	22·32
Providence	22·36	22·64
Cleveland	21·95	21·83
Pittsburg	21·82	21·78

In comparing the death-rates of different localities, or of the same locality at different times, the best means of eliminating the influence which differences in the proportion of persons of various age-groups exercise upon the death-rates is by the preparation of life-tables, from which can be calculated the expectation of life at each age.

The following table shows the approximate expectation of life, in years, at each of certain ages, for certain cities and States, at certain periods of time:

LOCALITIES.	AGES.							
	At birth.	5.	10.	15.	25.	35.	45.	65.
New York city, 1879–81:								
Male	29·04	44·85	42·40	38·24	31·18	25·29	19·80	9·89
Female	32·77	47·71	45·27	41·15	33·95	28·13	22·35	11·15
Boston, 1880:								
Male	37·04	50·71	47·49	43·20	36·40	30·22	23·51	11·93
Female	39·11	51·00	48·42	44·15	37·58	31·13	24·58	12·50
Philadelphia, 1880:								
Male	40·16	50·39	46·96	42·62	35·39	29·06	22·62	11·36
Female	43·70	53·64	50·15	45·99	38·63	32·29	25·86	13·17
Baltimore, 1880:								
White—Male	36·49	50·46	48·50	44·35	36·86	30·04	23·35	11·57
Female	39·86	52·99	50·83	46·58	39·27	32·81	25·99	12·77
Colored—Male	21·00	41·84	40·06	36·84	31·02	24·51	18·91	8·96
Female	25·51	46·79	44·75	42·00	36·34	30·72	24·56	12·48
Charleston, 1880:								
White—Male	35·51	44·77	41·84	37·83	30·02	24·88	19·97	9·45
Female	41·17	51·43	46·63	42·52	35·42	30·03	23·53	11·43
Colored—Male	21·30	39·65	37·29	34·30	28·95	23·86	17·75	8·77
Female	22·33	41·71	38·64	35·10	30·40	25·35	19·09	9·35
Cincinnati, 1880:								
Male	37·73	49·87	46·96	42·62	34·94	28·10	22·07	10·94
Female	43·16	54·26	51·26	46·95	39·47	32·72	25·86	12·56
Chicago, 1880:								
Male	38·11	52·44	50·61	46·67	38·96	31·98	24·98	12·41
Female	41·29	53·35	51·62	47·54	40·09	33·08	26·17	12·96
St. Louis, 1880:								
Male	36·75	51·90	48·25	43·99	36·02	29·27	22·80	13·06
Female	41·16	55·49	51·83	47·52	39·92	33·40	26·84	13·93
San Francisco, 1880:								
Male	38·02	46·44	42·69	38·47	31·14	25·04	19·75	10·44
Female	44·62	52·64	48·82	44·30	36·85	30·52	24·08	12·28
Massachusetts, 1883–87:								
Male	39·72	52·43	49·27	45·13	38·24	31·65	24·88	12·42
Female	42·03	52·97	49·95	45·94	39·28	33·02	26·41	13·60
New Jersey, 1880:								
Male	45·59	54·71	51·57	47·36	39·80	32·71	25·70	13·25
Female	48·05	55·66	52·52	48·40	41·15	34·37	27·24	13·63

Different races in the U. S. differ considerably as to death-rates and expectation of life. The death-rate of the colored is greater than that of the whites, especially among children under five years of age, and among adults the death-rate of the Irish is greater than that of the Germans, which, in its turn, is greater than that of persons whose parents were born in the U. S. The Jewish race has a lower death-rate than any other.

It is in most cases impossible to distinguish the influence upon the duration of life and liability to death exerted by those hereditary peculiarities of bodily structure which make up race differences, and the influence exerted by the place and mode of life of the great masses which constitute different races. For example, the average annual death-rates in New York city for the six years ending May 31, 1890, among those fifteen years of age and upward, were, for the whites whose mothers were born in Ireland, 28·01; for those whose mothers were born in Germany, 17·04; for those whose mothers were born in the U. S., 15·91; for those whose mothers were born in Russia and Poland—that is to say the Russian and Polish Jews—6·21 per 1,000. The last-named class lived in overcrowded tenement-houses and were poor, so that in this case the low death-rate may be fairly attributed to race peculiarities. The heavy death-rate among the Irish adults was largely due to tuberculosis, to pneumonia, and to the immediate or remote effects of alcoholic drinks; but it is hard to distinguish between the effects of race *per se* and the effects of poverty, uncleanliness, and intemperance in this class.

The death-rates of single adults twenty-five years of age and upward are greater than those of the married; thus in New York city the death-rate of white single males forty-five years of age and upward is, for native-born, 39; for Irish, 82; and for Germans, 65; while for the married of the same age-group it is, for native-born, 31; for Irish, 44; and for Germans, 37 per 1,000. A part of this difference is no doubt due to the fact that feeble, sickly, and indolent persons are to be found in larger proportion among the single than among the married.

As no country or city has a system of registration of cases of sickness, except of cases of certain contagious diseases, it is impossible to give sickness-rates for any large population. From data obtained from army and navy records, from mutual benefit societies, and a few other sources, it has been estimated that for every death in a community there are two persons constantly sick, or, in other words, there is an average of two years' sickness to each death. If by "sickness" is meant disease or injury which makes a person unable to work or to do business, this is an excessive estimate for the U. S., and one and one-half years' sickness to each death is probably nearer the truth. It must be remembered, however, that this applies only to the total of sickness and injuries, and not to individual diseases, as, for example, to cancer and to pneumonia.

Occupation as Influencing the Death-rate.—The occupation of a man may affect his health and length of life directly or indirectly. The direct influence of occupation is due to its bringing the person into relation with certain special causes of disease or of death, such as chemical poisons, dusts acting by their physical characters upon the lining membranes of the air-passages, noxious vapors, unusual temperature or atmospheric pressures, pathogenic micro-organisms, accidents, injuries, etc. The indirect influence of a given occupation upon health is exerted through the social condition and general method of life connected with that occupation, which depend, to a considerable extent, although by no means exclusively, upon the remuneration which it gives.

Certain trades or occupations are selected by people with reference to their own physical strength and powers of endurance, since those trades which require much muscular exertion can not be followed by feeble or sickly persons; and hence those employed in such trades are, to a certain extent, picked men, while, for the same reason, some of the lighter occupations are apt to be followed by persons among whom there is more than the usual proportion of weakly people. The difficulties in obtaining reliable and useful statistics of sickness and death rates pertaining to different occupations are many and great. The nomenclature and classification of occupations used in different countries do not agree, and each of them is confused and unsatisfactory from the point of view of the vital statistician. The age-grouping of the persons engaged in a particular occupation has a great influence upon the sickness and death rates pertaining to it; a man often changes his occupation as he becomes old, and many persons have two or more occupations which they follow at different seasons of the year.

The modern applications of machinery in manufactures have tended to produce simplicity and monotony in occupations, and to confuse the nomenclature of trades; they have, in fact, created a new class, who may be called machine-feeders, the precise nature of the material furnished the machine being a matter of secondary importance, so far as the health of the workman is concerned. The occupation of a man reported as a shoemaker to-day, either on a cen-

sus schedule or on a death certificate, may be quite different from that implied by the same term used in 1875.

Effect of Sedentary Occupations.—As a rule, those occupations which involve work out of doors are more healthful than those which are carried on indoors, and those which require a certain amount of muscular exercise, especially of a varied character, are more healthful than those which call for little muscular effort and are often spoken of as sedentary occupations. For example, in England, during the years 1880, 1881, 1882, if the average annual death-rate for males from twenty-five to sixty-five years of age be taken as equal to 1,000, then the rate during the same period for men of the same age-group was, for clergymen, priests, and ministers, 556; for gardeners and nurserymen, 599; for farmers and graziers, 631; for agricultural laborers, 701; for schoolmasters and teachers, 719; for shipbuilders, 775; for fishermen, 797; for carpenters, 820; for lawyers, 842; for shopkeepers, 877; for printers, 1,071; for cotton manufacturers, 1,088; for physicians, 1,122; for butchers, 1,170; for brewers, 1,361; for file-makers, 1,667; for Cornish miners, 1,839; and for innkeepers and innservants, 2,205.

The following table is an extract from one prepared by Jacques Bertillon, showing for the years 1885 to 1889 the average annual death-rate per 1,000 in certain occupations for males in Paris with distinction of four groups of ages:

OCCUPATION.	AGES.			
	20–29.	30–39.	40–49.	50–59.
Average for all males of Paris	11·1	14·9	21·2	31·2
Physicians and surgeons	9·9	11·3	9·8	21·9
Lawyers	9·8	11·6	11·1	22·8
Clergymen and members of religious orders	5·0	8·2	9·0	30·5
Drivers and carmen	17·6	21·5	26·7	30·4
Jewelers, watchmakers, and fine-metal workers	9·7	14·0	14·9	24·7
Printers, lithographers, and engravers	17·8	23·7	26·7	40·6
Liquor-dealers and eating-house keepers	12·0	21·2	25·7	30·2
Bakers	12·4	16·2	24·4	39·0
Barbers, hair-dressers, wig-makers	14 8	14·2	18·1	33·2
Boot and shoe makers	13·4	19·2	20·4	35·3
Stair-builders, plumbers, plasterers	15·0	22·3	25·2	44·1
Painters, glaziers, decorators	14·8	23·0	28·8	42·0
Masons and stonecutters	9·5	16·0	23·7	31·4
Carpenters and joiners	10·5	18·8	24·3	30·7
Tanners and curriers	9·1	10·5	15·9	26·4
Founders, heavy-metal workers	9·4	11·4	15·4	22·6
Machinists	12·7	16·2	21·2	36·0
Horticulturists	11·1	13·6	21·6	30·0

The diseases which are more than usually prevalent among the clergy are diseases of the nervous system, including diabetes and insanity with suicidal tendencies, heart disease, diseases of the kidneys, and clergyman's sore throat. Among the legal profession heart disease and diseases of the nervous system, especially apoplexy, cause more than the average number of deaths. Medical men suffer especially from diseases of the heart and nervous system, and from specific, contagious, and infectious diseases, including pneumonia.

Effects of Materials Used.—Of the trades in which the workmen are most liable to be affected by the poisonous nature of the materials with which they work, may be mentioned the manufacture of white lead, file-making, painting and glazing, glass-polishing, and the plumber's trade, as giving rise to lead-poisoning in the forms of colic, paralysis, or various affections of the nervous system and of the kidneys. Gilders, looking-glass makers, furriers, and hatters are liable to chronic mercurial poisoning; match-makers, to necrosis of the jaws, produced by phosphorus; workers in chromic acid and dichromates, to a peculiar ulceration in the nostrils; workers in colored paper and feathers, to arsenical poisoning; workers in kerosene oil and paraffin, to a peculiar eruption of boils; workers in eosin, to excessive sweating of the hands, followed by tenderness and fissures of the skin.

The occupations which have a special tendency to produce disease through the dusts connected with them and inhaled by the workmen are numerous, including coal-mining, the manufacture of earthenware, china, and cutlery, of cotton and woolen goods, and of bleaching-powder, rag-sorting, etc. When the dusts act solely or mainly as mechanical irritants to the air-passages, their first effect is to produce congestion or a low grade of inflammation, which makes the tissues specially susceptible to the influence of the bacillus of tuberculosis, and hence consumption is more than usually prevalent among workers in such trades, as will be seen by the table in the next column, given by Dr. Ogle.

COMPARATIVE MORTALITY OF MALES IN CERTAIN DUST-INHALING OCCUPATIONS FROM PHTHISIS AND DISEASES OF THE RESPIRATORY ORGANS.

OCCUPATION.	COMPARATIVE MORTALITY FROM		
	Phthisis.	Diseases of respiratory organs.	Phthisis and diseases of respiratory organs.
Coal-miners	64	102	166
Carpenters, joiners	103	67	170
Bakers	107	94	201
Masons, bricklayers, builders	127	102	229
Wool, worsted-workers	130	104	234
Cotton-workers	137	137	274
Quarrymen	156	138	294
Cutlers	187	197	384
File-makers	219	177	396
Earthenware-makers	239	326	565
Cornish miners	349	231	580
Fishermen	55	45	100

Effects of Vapors and Gases.—Offensive and more or less noxious vapors or gases are produced in many processes of manufacture. The fumes of mercury, arsenic, zinc, and copper are always more or less harmful. The effluvia connected with decaying animal and vegetable matters, or produced in manufacturing processes in which such articles are employed, as, for example, in the production of fertilizers, in bone-boiling, soap-making, etc., often are very offensive, and appear to be injurious to the general health of those exposed to them, although they do not seem to produce specific diseases. Habit has much to do with the effects which they produce; the laborers in such establishments do not notice odors which produce nausea, headache, etc., in persons not accustomed to them. The vapor of carbon disulphide, given off in the manufacture of India-rubber, produces various disorders of the nervous system, beginning usually with persistent headache, followed by vertigo, cramps, muscular tremor, and debility, and finally by great mental and physical depression. Hydrogen sulphide, when pure, is a highly poisonous gas, but the evidence is conflicting as to its effects when considerably diluted. It is given off in considerable quantity from the waste heaps of alkali-works. The manufacture of illuminating-gas involves the production of dangerous and offensive gases, but the laborers do not appear to suffer especially from their occupation.

Effects of High Temperatures.—The effects of exposure to excessively high temperatures are seen in firemen and stokers, and in workers in foundries, glass-works, and in certain hot mines; but it is often difficult to distinguish these from the results of other causes of disease, such as intemperance, etc. The immediate effects of exposure to high heat are those of congestion of the brain, or more commonly those due to feeble action of the heart, corresponding to the two forms of sun or heat stroke. Remoter effects are seen in the liability to pulmonary disease and to rheumatism.

The effects of variations in atmospheric pressure are seen in those who work in compressed air, as in caissons or in diving-bells. Besides pain in the ear due to tension of the membrana tympani, as a result of the unequal atmospheric pressure on its surfaces, which sometimes produces rupture of the drum, these effects include feeble action of the heart, local congestions, headache, pains in the limbs, and paralysis. The worst effects are produced by a too rapid change from compressed air to air of ordinary pressure, which may produce death by effusion of blood at the base of the brain and in the spinal cord.

Effects of Micro-organisms.—The effects of pathogenic micro-organisms, excluding those in which special exposure to such organisms is due to locality, are seen in butchers, whose wounds are liable to septic infection and to inoculation with anthrax; in those who handle hides and skins, who are liable to anthrax in the form of malignant pustule, and in rag and wool sorters, who are liable to smallpox and internal anthrax. JOHN S. BILLINGS.

Vitascope: See the Appendix.

Vitebsk' (Polish, *Witebsk*): a government of Western Russia; area, 17,440 sq. miles. It formerly belonged to the grand duchy of Lithuania. The surface is mostly flat, covered with forests and immense marshes, with about 2,600 small lakes. The Dwina, with its navigable tributaries and connecting canals, is an excellent artery for export trade. Flax, linseed, timber, and hides are the chief articles of export; rye, oats, and potatoes are the chief agricultural products. Pop. (1897) 1,502,895, chiefly White Russians and Letts.

Vitebsk: capital of the government of Vitebsk; on both sides of the Dwina, and on the Smolensk-Riga Railway (see map of Russia, ref. 7–C). It is an old town, once of some importance, but it now has no manufactures. There is, however, an active trade with Riga in grain, flax, hemp, timber, and cattle. Vitebsk was annexed by Russia in 1772 at the first partition of Poland. Pop. (1897) 66,143, one-half being Jews. H. S.

Vit'ellin [from Lat. *vitel'lus*, yolk of an egg]: the albuminoid or proteid constituent of the yolk of eggs. See ALBUMINOIDS and YOLK.

Vitel'lius, AULUS: emperor; b. in Rome, Sept. 24, 15 A. D.; was a great favorite with Caligula, Claudius, and Nero, who bestowed the highest offices and greatest honors on him, although he was a man of sluggish and profligate character, and quite without ambition. Galba sent him to Germany in Dec., 68, as commander of the legions there, and here he was proclaimed emperor by the soldiers Jan. 3, 69. His friends urged him forward, and fortune favored him. Galba was murdered Jan. 15, and Spain and Gaul recognized Vitellius. In Rome Otho had assumed the imperial dignity, but he was defeated at Bedriacum by Vitellius's generals, and stabbed himself. In July Vitellius entered Rome at the head of an army, or rather a loose band, of about 60,000 soldiers. He made very few confiscations or executions; he seemed bent only on gluttony and excesses, and for these purposes he spent fabulous sums. Meanwhile VESPASIAN (*q. v.*) had been proclaimed emperor by the armies of the East, and his generals approached Italy. Vitellius now found nothing but indifference or treachery. He tried to negotiate, but failed. He offered to resign, but too late. He was found hiding in a corner of the deserted palace, was dragged out into the Forum, and put to death by a common soldier in Dec., 69. Revised by G. L. HENDRICKSON.

Vitellus: the yolk of an egg. See EMBRYOLOGY and YOLK.

Viter'bo: city and commune in the province of Rome, Italy; 42 miles N. W. of Rome; at the northwestern base of Monte Cimino (see map of Italy, ref. 5–D). It is in a fertile region which yields abundantly grain, hemp, tobacco, olives, and wine. There are in the vicinity numerous mineral springs of various kinds. Among these is the *Bulicame*, a large hot spring in constant ebullition, mentioned by Dante. The city has several beautiful fountains and magnificent palaces. The Gothic cathedral contains the tombs of three popes; and on the steps of the high altar Henry, nephew of Henry III. of England, was murdered by Guy de Montfort. The Churches of Santa Rosa, S. Francesco, and of the Osservanti del Paradiso are famous for their tombs of saints and popes, as well as for their paintings and frescoes. In the old episcopal palace, a Gothic building of the thirteenth century, several elections of popes took place. Etruscan cemeteries and some Etrusean sarcophagi in the town-hall make the city particularly interesting. Viterbo is supposed to occupy the site of the ancient *Fanum Voltumnæ*, the place of the Etrusean general assembly. Pop. 16,320; commune 19,655. Revised by HERMANN SCHOENFELD.

Vitet, vē'tā', LOUIS: author; b. in Paris, Oct. 18, 1802; was educated as a teacher, but took up journalism and literature; became a contributor to the *Globe*, and published with considerable success the dramatic poems *La Journée des Barricades* (1826), *Les États de Blois* (1827), and *La Mort de Henri III.* (1829). From the Revolution of July, 1830, to the *coup d'état*, Dec. 2, 1851, he held various offices in the civil service, but retired then into private life, and devoted himself exclusively to literature. His principal works are *Eustache Lesueur* (1843), a biography; *Monographie de l'Église de Notre-Dame de Noyon* (1845); *Fragments et Mélanges* (2 vols., 1846); *Essais historiques et littéraires* (1862); *Études sur l'Histoire de l'Art* (1864); *Lettres sur le siège de Paris, 1870–71.* D. in Paris, June 5, 1873. The posthumous *Études philosophiques et littéraires* (1874) contains a biographical notice by Guizot. Revised by A. G. CANFIELD.

Viti Islands: See FIJI ISLANDS.

Vitiligo: See OLD AGE, DISEASES OF.

Vitis: See GRAPE.

Vito'ria: fortified town of Spain; capital of the province of Alava; 29 miles S. of Bilbao (see map of Spain, ref. 12–G). It consists of an old town, narrow, gloomy, and dirty, and a new town, open, airy, and elegant, on a lower level, with many fine buildings and beautiful promenades. Articles of brass, iron, ebony, earthenware, leather, and chocolate are manufactured, and a brisk trade in oil, wine, fruits, and grain is carried on. Here on June 21, 1813, the allied British and Spanish army under Wellington gained a victory over the French under Jourdan. Pop. (1897) 30,514.

Vitré, vē'trā': town; department of Ille-et-Vilaine, France; on the Vilaine; 24 miles by rail E. of Rennes (see map of France, ref. 4–C). It is a curious old place, with manufactures of leather and woolens, and some trade in wax, honey, and grain. Pop. (1896) 10,584.

Vitrification: the process of converting into GLASS (*q. v.*).

Vitrified Forts [*vitrified* is Lat. *vi'trum*, glass + *fa'cere*, make]: a remarkable class of prehistoric fortifications almost peculiar to Scotland and its islands. They are made of siliceous stone, and the inside—in some cases the outside, or indeed the whole mass—has been vitrified by the action of fire and of wood-ashes, the stone being transformed into a kind of glass. Whether the vitrification was intentional or not is a moot question.

Vit'riol [viâ O. Fr. from Late Lat. *vitri'olum*, liter., neut. of *vitri'olus*, *vitre'olus*, dimin. of *vi'treus*, glassy, deriv. of *vi'trum*, glass]: a generic name among the earlier chemists for the *sulphates*, often still applied in common language. Thus iron sulphate is *green vitriol* or iron vitriol, copper sulphate is *blue vitriol* or copper vitriol, zinc sulphate is *white vitriol* or zinc vitriol, etc. Sulphuric acid was also called oil of vitriol for the reason that it was made from iron vitriol.

Vitriol, Oil of: See SULPHURIC ACID AND SULPHATES.

Vitru'vius Pol'lio: a Roman architect and author of a treatise on architecture in ten books dedicated to the Emperor Augustus. The place of his birth is uncertain, but from the testimony of an inscription found in Verona, this place has been suggested. His work appears from internal evidence to have been composed about B. C. 14. In respect to its subject it is very important, as it is the only one of the kind that has come down to us, and it is expressly mentioned by Pliny as one of his authorities. His chief sources, apart from his own experience, were Greek writers, but his knowledge of Greek seems deficient. Though he possessed varied learning and a philosophic turn, he appears to have been an unpracticed author, and frequently fails to express himself intelligibly. Some things, indeed, are obscure from our own want of information on this subject at this distance from the period of the writer. There is an abridgment of the work by a very ancient but unknown author, who has preserved the arrangement of the original, but has limited the subject to private buildings. Vitruvius has been translated by Newton in 2 vols. fol., with 47 plates (London, 1771–91), and by Gwilt (London, 1826; improved ed. 1860). The best edition of the original is by Schneider (3 vols., Leipzig, 1807).

Vitto'ria: town; province of Syracuse, Sicily; about 20 miles N. W. of Modica (see map of Italy, ref. 10–F). In the neighboring plains are raised vast quantities of the soda-plant, the ashes of which are exported to Marseilles for the use of the soap-factories of that city. This town received its name from a victory obtained by Roger over the Arabs in 1092. Pop. 21,760.

Vittoria, ALESSANDRO: architect and sculptor; b. at Trent, Austria, in 1525. He went to Venice at the age of fifteen and became a pupil of Sansovino. His work is to be found in Venice, Vicenza, Padua, Treviso, Brescia, and Verona. Although much that he did has been destroyed, much still remains, for instance the caryatides at the side of the door of the Marciana library, as also the stucco ornaments of its staircase and those of the Scala d'Oro of the ducal palace in Venice; also the stucco ornaments of several rooms in the Trevisano palace at Murano. He worked with Paolo Veronese at the decorations of Palazzo Morosini, also in SS. Giovanni e Paolo in Venice. The Chapel of the Rosary, Venice, contains several statues of saints by Vittoria, and three are in the second chapel to the right of the entrance in San Francesco della Vigna, in the same city, besides two statues in bronze on the columns near the font of holy water. Vittoria was a skillful medalist as well. It is recorded that, notwithstanding the immense number of commissions given him, he appealed in 1585 for exemption from taxation on the plea that times were so bad he could not make both ends meet. D. May 27, 1608. See Temenza, *Vita di Alessandro Vittoria* (Venice, 1827). W. J. STILLMAN.

Vittoria Colonna: See COLONNA, VITTORIA.

Vittorino da Feltre: See the Appendix.

Vivanco, vēē-vaăn'kō, MANUEL IGNACIO: general; b. at Lima, Peru, in 1806. He left the University of San Carlos to join the patriots in 1820; served through the war for independence and continued in the army under Gamarra and Santa Cruz. In Jan., 1841, he declared against Gamarra at Arequipa, assuming the title of supreme chief; but he was defeated, and fled to Bolivia. In 1842 he returned, and at first supported Vidal; but after the resignation of the latter he headed another revolt, occupied Lima Apr. 8, 1843, and remained in power until July 17, 1844, when he was defeated by Castilla at the battle of Carmen Alto and forced to fly from the country. In 1851 he was an unsuccessful candidate for the presidency, and in 1856–58 he headed a revolt which was temporarily successful at Arequipa, and was suppressed only after much fighting. Subsequently he was prominent in the senate and as a diplomatist. D. in Chili, Sept. 1873. HERBERT H. SMITH.

Vivarini, vēē-vaă-ree'nēē, ANTONIO: also called ANTONIO DA MURANO; eldest of a family of painters born at Murano, Italy, in the fifteenth century. The name of this painter is first found on certain pictures painted between 1440 and 1446, with a certain Joannes. They are signed *Joannes et Antonius de Muriano fecerunt*. One of the finest examples of this master's work is the great altarpiece on canvas, painted in 1446, now in the Venetian Academy. After 1450 Antonio seems to have painted with his younger brother Bartolommeo, as the name of Joannes no longer appears. An altarpiece, commissioned by Pope Nicholas V. in commemoration of Cardinal Albergati, as the inscription on the picture indicates, is signed by the two brothers, and is in the Pinacoteca of Bologna. In the Lateran at Rome is an altarpiece by Antonio alone, originally in Sant' Antonio at Pesaro. In the Berlin Museum there is an *Adoration of the Kings* by this master, and a fragment of a picture is in the London National Gallery. D. in 1470.—BARTOLOMMEO VIVARINI, the younger brother of Antonio, seems to have studied at Padua in the school of Squarcione; the lengthened forms, the severity of type in the male heads in the altarpiece in the Bologna Gallery, indicate a new influence; the use of gold and of garlands of fruit and flowers and fluttering ribbons is borrowed from the Paduans. Bartolommeo's power of coloring obtained for him a high reputation among early Venetian painters. Two triptychs in the Frari at Venice are among his best works, but the great inequality of painting in the pictures bearing his name would lead to the conviction that some were executed by assistants. The last date on his work is 1499. Nothing is known of his subsequent life. W. J. STILLMAN.

Viver'ridæ [Mod. Lat., named from *Viver'ra*, the typical genus, from Lat. *viver'ra*, ferret]: a family of carnivorous mammals containing the civets and allied types. The form is generally more or less elongated, somewhat similar to that of the weasels; the head is long and terminates in a prominent snout; the feet are neither typically digitigrade, as in the cats and dogs, nor plantigrade, as in the bears, but rather intermediate; the toes are mostly well developed, the claws sharp; the tail more or less elongated; the teeth thirty-six to forty in number, and moderate in size (I. $\frac{3}{3}$; C. $\frac{1}{1}$; P. M. $\frac{4}{4}$, exceptionally $\frac{3}{3}$; M. $\frac{2}{2}$, rarely $\frac{1}{2}$); the true molars of the upper and last of the lower jaw tubercular; the auditory bullæ are divided internally and are externally constricted; the intestinal canal is generally provided with a cæcum. The family is peculiar to the Old World, and especially the tropical portions of Asia and Africa. The species are numerous, of small or moderate size, mostly ranging from the dimensions of a weasel to those of a dog. They are all carnivorous, preying on small animals of various kinds, some attacking chiefly, by preference, birds, others serpents, others insects, and still others eating eggs; but they often fail to discriminate, and may take to either kind in the absence of a choice. The paradoxure (*Paradoxurus typus*) of India is a typical species. It is about the size of a cat, but has a longer tail; the fur is harsh, blackish gray, with darker bands, and there is a light spot on the forehead and under each eye. It is less carnivorous than many of the other species and, like others of the genus, is somewhat arboreal in its habits. See also BINTURONG, CIVET, GENET, ICHNEUMON, and MUNGOOS. F. A. LUCAS.

Vives, vēē'ves, JUAN LUIS, D. C. L.: educator and classical scholar; b. at Valencia, Spain, Mar. 6, 1492; studied at the Universities of Paris and Louvain; was called to England by Henry VIII. as tutor to the Princess Mary in 1523, for whose use he wrote his *De ratione studii puerilis*, the *De institutione fœminæ Christianæ*, and the *Satellitium animi*, a collection of apothegms (re-edited in 1883 by Wychgram); was disgraced and imprisoned for having argued and written against the divorce of Queen Catharine of Aragon (1528). On his release (1529) he became a classical teacher at Bruges, where he died May 6, 1540. He was an intimate friend of Erasmus and Budæus, and his writings contributed not a little to the revival of letters in his time. Among these are the commentaries to St. Augustine's *De civitate dei* (1522), his masterpiece; *De anima et vita* (1538), the first exegetical edition of this Aristotelian treatise; *In Bucolica Vergilii interpretatio*; *De disciplinis libri XV.* (1531); *De ratione dicendi* (1533); *Linguæ Latinæ exercitatio* (1539, and frequently republished); *De subventione pauperum* (1526), one of the earliest essays on this subject. His entire works were collected by Mayani (8 vols., Valencia, 1790). See A. I. Namèche, *Mémoire sur la vie et les écrits de Vives* (Brussels, 1841). ALFRED GUDEMAN.

Vivien de Saint-Martin, vēē'vyaăn'de-săn'maăr'tăn', LOUIS: geographer and author; b. at St.-Martin-de-Fontenoy, France, May 17, 1802. He early engaged in literature as a profession, removing to Paris; his first publication was a *Carte Électorale* (1823), and his second an atlas, one of the best of its time (1825). A geographical journal, the *Bibliomappe*, which he founded in 1828, was given up in 1830; and thereafter, during many years, he accepted such tasks as the publishers gave him; these included a work on agriculture, a revision of Verger's *Dictionnaire français*, translations of Scott's novels, *Histoire générale de la Révolution française* (4 vols., 1840–42), and *Histoire de Napoléon* (2 vols., 1843). In 1845 he became editor of the *Nouvelles Annales de Voyages*, and was thus able to devote his time to his favorite geographical studies. A great work, the *Histoire universelle des découvertes géographiques des nations européennes*, was planned, but was interrupted by the revolution of 1848, after two volumes had appeared. It was followed by several important works on historical geography, the latest being *Histoire de la géographie et des découvertes géographiques* (with atlas, 1873). From 1863 to 1876 he edited the *Année géographique*, relinquishing it to direct the *Nouveau Dictionnaire de géographie universelle*, a monumental work. After two volumes had been published he resigned the editorship to Rousselet. D. Jan. 3, 1897.

Vivisection [Lat. *vi'vus*, alive + *sec'tio*, a cutting, deriv. of *seca're*, *sec'tum*, cut]: literally, the "opening of the living body," in contradistinction to that of the dead body (*sectio cadaveris*). The examination of the interior of the dead body, both in animals and in man, is resorted to for purposes of anatomical research, and also to ascertain the changes produced by disease. Vivisection, on the other hand, is employed for investigating, in the lower animals, the action of the organs during life. The term, however, though strictly applicable, in its etymological sense, only to cutting operations, is used to designate all experiments of a scientific nature performed upon living animals, whether they consist of division of the parts by cutting instruments, or their compression by ligatures, or the subjection of the animal to special conditions of food, temperature, or respiration, or to the action of drugs and medicines. In all these cases the object of the experimenter is to ascertain some fact in physiology or pathology which can not be otherwise investigated.

The necessity for resorting to experiments upon living animals in physiology and the allied sciences depends upon the obvious fact that these sciences have to deal with the actions and phenomena of life; and consequently, in order to study them successfully, the necessary investigations must be made while life is going on. Examination of the dead body reveals the form and structure of the internal parts, but it does not yield a knowledge of their physiological actions, because these actions have ceased and the organs have relapsed into a quiescent condition. Where the necessary steps of an experiment are of a nature to cause pain to the animal, as in cutting operations, this is generally avoided by the use of ether or chloroform, in the same manner as when these anæsthetics are administered for surgical operations upon the human subject. Pain, to a great extent, vitiates the results of most experiments, so that the investigator is naturally led to adopt every possible measure to prevent it. The results which have been attained by means of experiment upon the living body constitute nearly the whole of the actual knowledge possessed

in physiology, of the action of medicines, and of the germs that cause disease.

The earliest investigator of note who employed this method was Galen, and his discovery of the true function of the *arteries*, about the year 150 of the Christian era, forms a striking illustration of its necessity and usefulness. Previously to that time the arteries were thought, as their name indicates, to be air-tubes for distributing throughout the body the air taken in at the lungs; while the veins were regarded as the only channels for the conveyance of blood. This conclusion was naturally derived from the appearance of the two sets of vessels in the dead body; for at the time of death the blood leaves the arteries in great measure and accumulates in the veins, and when the body is opened and the arteries cut across, they resume their tubular form, owing to the elasticity of their walls. Thus the dissector of the dead body found the veins containing blood and the arteries containing air. When an artery was accidentally wounded during life and discharged blood, it was thought that it had first emptied itself of the air, and that the blood was afterward drawn into it from other parts. But Galen experimented upon this subject by exposing an artery in the living animal, and including a portion of it between two ligatures placed a certain distance apart. He then opened it between the ligatures, and showed that it discharged no air, but only blood. Consequently, it must have contained blood beforehand. This was the first demonstration of the important fact that the arteries are blood-vessels, and that there are in the body two kinds of blood—namely, venous blood in the veins and arterial blood in the arteries. William Harvey in 1628 completed our fundamental knowledge of the circulation by his discovery that the blood, after passing from the heart outward through the arteries, returns again to the heart by the veins, thus moving in a continuous round through the vascular system. This discovery was also the fruit of experimentation on living animals; and it was by the same means that other eminent physicians of the time, who at first doubted Harvey's doctrine, were finally enabled to convince themselves of its truth. The real action of the heart as a propelling organ for the blood and the true nature of the arterial pulse were both parts of the same discovery, and were ascertained in a similar way.

The knowledge thus gained of the circulation was not only of the highest value in itself, but soon led to other important results, one of which was the possibility of the *transfusion of blood* from one animal to another. This was first demonstrated in 1665 by Richard Lower, who succeeded in transferring blood from the vessels of one dog into those of another, the second dog being allowed to bleed freely at the same time, but being kept alive by the blood received from the first. This showed that death from hæmorrhage might be prevented by the introduction of blood from another animal of the same species. After a variety of successes and failures in applying this operation to the human subject, the matter was again investigated experimentally by Dr. Blundell in 1824, and has been the subject of numerous later researches. They have resulted in improved methods of performing the operation, and in greater knowledge of its proper application as a remedy. It is now a recognized means of preserving life in cases of exhaustion from abundant or long-continued hæmorrhage.

The function of *respiration*, which is immediately essential to life, has come to be understood mainly through experiments upon animals. The first important knowledge in regard to it was obtained in 1670 by the Hon. Robert Boyle, who inclosed animals of various kinds in the receiver of the air-pump, then a recent invention. He demonstrated in this way not only that atmospheric air is necessary in all cases to the maintenance of life, but also that when confined in a limited space it becomes vitiated by continued respiration, and that in order to maintain life the vitiated air must be removed and be replaced by a fresh supply. It was soon afterward found by MAYOW (*q. v.*) that the air thus vitiated by the respiration of animals was also diminished in volume; and he concluded, accordingly, that something in it was consumed or used up by the process of respiration. Lavoisier in 1777 discovered, by experimenting with sparrows, that the respirable ingredient of the air could be removed by the calcination or oxidation of mercury; showing that the substance (oxygen) which combined with the metal was the same as that absorbed by animals in the process of breathing. But if he set free the oxygen from its metallic combination, and added it to the irrespirable residue of the air, the mixture again became respirable and capable of supporting life. He further proved that the animals in breathing not only consumed the oxygen of the atmospheric air, but at the same time exhaled another gas—namely, carbonic acid—which could be made to unite with lime water and form calcium carbonate. In this manner it was ascertained that the process of respiration consists essentially in the absorption of oxygen and the exhalation of carbonic acid. Without the knowledge of such fundamental facts all further discovery in this direction would be impossible; but since the time of Lavoisier many important particulars have been, and are still being, added to physiology, as to the time, place, and quantity, of the absorption and discharge of the gases of respiration, their relation to each other, the mode of their consumption and production in the body, and their influence upon the fitness of the air for breathing. The whole subject of ventilation and its practical application for the preservation of health depend upon a distinct knowledge of the composition of the air and its physiological properties in regard to respiration.

The functions of the *nervous system* have been the subject of experimental investigation from very early times. Galen showed that the nerves are the channels through which the commands of the will are conveyed to the muscles, and that the spinal cord is the conductor for voluntary impulses proceeding from the brain to the nerves of the body and limbs. The researches of modern physiologists have been directed to ascertain the special functions residing in particular nerves or nerve-centers. The localization of definite functions to definite parts of the nerve-centers, the different properties of the anterior and posterior roots of the spinal nerves—of which the former serve for motion and the latter for sensation—the distinction between the motor and sensitive nerves of the face, the connection of the medulla oblongata with various important functions, and the influence of the pneumogastric nerve on the movements of the chest and the action of the heart—are a few examples among many of the important discoveries effected in this way. A knowledge of these details is essential for the medical practitioner, since it is only by their aid that he can learn from the external nervous symptoms what is the nature of the internal injury or where it is located.

The natural mode of the *reproduction of bone* when a portion of its substance is destroyed or removed was discovered by a series of researches extending from 1740 to 1858, and conducted mainly by Duhamel, Hunter, Syme, and Ollier. When a bone is broken into small pieces, or when it is otherwise so injured that a considerable part of it must be removed, the remnants generally fail to unite with each other by solid tissue, and the limb, remaining permanently flexible at the point of fracture, is accordingly of no value for practical purposes. Formerly, such a limb was often amputated, in preference to leaving it as a useless incumbrance to the patient. But it was discovered by the experiments above mentioned that if the fibrous covering of the bone, or its "periosteum," were left behind in such cases, while the broken fragments were removed, new bony tissue would be produced and a solid union effected. This method of practice was consequently adopted in the treatment of fractures in the human subject, and has been the means of saving many limbs which in the absence of such treatment would have been left in a state of deformity or wholly sacrificed.

The foregoing illustrations indicate the manner in which experimentation on animals has been rendered serviceable to physiological science and to practical medicine. It has also produced results of value in other directions, among which may be mentioned the practice and usefulness of *artificial respiration* in cases of drowning, hanging, suspended animation of newly born infants, and in poisoning; the improved surgical operation for the cure of *aneurism*; the successful study of the various *digestive secretions*; the investigation of *infectious and contagious diseases*; the best treatment for *venomous wounds*, like those of the rattlesnake; and the action of *poisons, drugs, and medicines*, with their uses in disease and their antidotes.

Moreover, the enormous advances in recent years in brain surgery, abdominal surgery, the pathology and treatment of disease, etc., have been wholly or largely due, directly or indirectly, to the results of vivisection. It is only by such means that we can hope for radical and rapid advances in medical science.

Revised by EDWARD T. REICHERT.

Vizagapatam': town; presidency of Madras, India; the capital of the district of Vizagapatam; at the entrance of the Veragatam into the Bay of Bengal; in lat. 17° 41′ N. (see map of S. India, ref. 4–G). It has a good harbor, sheltered by the Dolphin's Nose, a cliff about 1,500 feet high, and is a military station. Near the latter is the suburb occupied by Europeans, called Valteru, and considered very healthful. Pop. (1891) 34,487.

Vizcaino, vĕĕth-kăă-ee'nō, SEBASTIAN: navigator; b. at Huelva, Spain, about 1550. He was long prominent in Mexico, made an unsuccessful attempt to explore the peninsula of Lower California 1596–97, and in 1602–03 successfully explored the same coasts to lat. 42° N., one of his ships going on to lat. 43°, now included in the coast of Oregon. In 1610 he commanded an expedition to Manila; thence he went on to Japan, taking two Franciscan missionaries to that country, and attempting to open commercial relations with the people. D. in Acapulco soon after 1614.

Vizetelly, HENRY RICHARD: See the Appendix.

Vizier, vi-zeer' [from Arab. *wazīr*, liter., bearer of burdens, porter, deriv. of *wazara*, bear a burden]: the title of many high dignitaries in Mussulman countries; first conferred by Abul Abbas, the first Abbasside caliph, on his prime minister (752). In the Ottoman empire since 1327 the grand vizier has been the representative of the sultan in temporal affairs and the chief minister of state. Alaeddin (d. 1359), elder brother of Sultan Orkhan, was the first Ottoman grand vizier. E. A. G.

Vlaar'dingen: town of the Netherlands; province of South Holland; on the Meuse; 5 miles W. of Rotterdam (see map of Holland and Belgium, ref. 6–F). It has a good harbor, and carries on an extensive herring-fishery and some ship-building and shipping business. Pop. (1890) 12,947.

Vladikavkaz, vlăă-dĕĕ-kăăv-kaats': fortified capital of the Terek province of Cis-Caucasia, Russia; at the elevated northern base of the Great Caucasus chain, and at the opening of the Terek valley from the mountain tracts (see map of Russia, ref. 11–G). It is the terminus of the railway system to the south, at the northern entrance to the pass to Tiflis and the Southern Caucasus. Its population (43,833 in 1897) has steadily grown with the commerce between Russia and the Caucasus, the carrying of merchandise to Tiflis and again northward being the chief occupation of the inhabitants. H. S.

Vladimir, vlăă-dĕĕ-meer': a government of Central Russia, comprising the greater part of the old principality of that name; area, 18,864 sq. miles. The country is mostly level, partially traversed by undulating hills, and extends over the eastern parts of the central plateau of Middle Russia. It is watered by the middle Volga and its chief affluent, the navigable Oka, which there unites with the Klyasma. The soil is fertile, more than half is adapted for cattle-rearing and agriculture, producing rye, oats, wheat, barley, flax, hemp, fruit; about 32 per cent. is covered with forests. In industrial pursuits Vladimir is second only to Moscow, having about 1,800 industrial establishments, mostly cotton (four-ninths of the entire Russian cotton production comes from Vladimir) and linen factories, manufactures of glass and chemicals, iron-works, distilleries, and tanneries. Iron ore, china-clay, and gypsum are common. Pop. (1897) 1,570,730, mostly Great Russians. HERMANN SCHOENFELD.

Vladimir: capital of the government of Vladimir; on the Klyasma; 120 miles by rail N. E. of Moscow (see map of Russia, ref. 7–E). It was founded about 1120, and was the capital of the principalities of Vladimir, Suzdal, and Rostoff (1157–1328). The ancient Kremlin, containing the Uspenskij Cathedral (built 1150), where all the princes of Vladimir have been buried, and the Golden Gate, an ancient triumphal gate and fortification, are the principal historical edifices. The city, connected by rail with Moscow and Nijnii-Novgorod, has some manufactures, though but little trade, and several churches that date from the twelfth century, a theological seminary, a gymnasium, and several high schools. Pop. (1888) 20,235. H. S.

Vladimir the Great: See RUSSIA.

Vladislaus: another spelling of LADISLAS (*q. v.*).

Vladivostok' (i. e. the ruler of the east): capital of the Primorskaya, or Coast Province, in Eastern Siberia, and the chief naval station of Russia on the Pacific coast (see map of Asia, ref. 4–I). The town is on the northern shore of the hilly peninsula of Muraviev-Amursky, which is called by the Russians the Golden Horn (*Zolotoi Rog*). Its harbor on Golden Horn Bay, with a depth of from 5 to 13 fathoms, is protected from wind and breakers by the opposite island of Dundas, and is spacious enough to hold a large fleet; but a crust of ice forming along the shore in December keeps vessels icebound for over a month. The Gulf of Peter the Great, in the Sea of Japan, which is divided by the peninsula of Muraviev into the large Amur and Ussuri Bays, was mapped in 1859 by the Russian ships America and Stryelok. The town was founded in 1861, and became a naval station for the Siberian fleet in 1870. The naval workshops were transferred at that time to Vladivostok from Nikolaïevsk, and large machine-shops for steamers, repair-shops, and docks established. The first batteries were built in 1876–77, in order to be ready in case of emergency, as in the event of a war with Great Britain. Vladivostok became the terminus of the overland telegraph line viâ Irkutsk and Kiachta, and is connected by a cable with Nagasaki (completed 1871) and Shanghai. The Great Siberian Railway (see *Engineering Magazine*, July, 1894), which is being pushed forward with great energy, will give to Vladivostok, as the terminus of the railway, an international importance, and, as the port for vessels carrying freight to and from Japan and the U. S., a degree of commercial prosperity heretofore impossible. In 1887 the imports to Vladivostok amounted to $2,890,500 ($2,150,000 from non-Russian, especially Chinese quarters). The exports fell from $209,500 in 1886 to $64,000 in 1887. The city on the Golden Horn, defended by strong batteries, is of irregular construction, and has but one street, the Svietlianskaya, along the harbor. There is a pro-gymnasium, a girls' high school (founded in 1862, the only one in the province), two naval schools, and a scientific society for the study of the Amur region. Pop. (1897) 28,896, nearly half Manchus and Koreans. See SIBERIA. HERMANN SCHOENFELD.

Vlissingen, or **Vliessingen**: See FLUSHING.

Voadica: See BOADICEA.

Vocative [Lat. *vocati'vus*, deriv. of *voca're*, to call]: an interjectional form of the noun. It is used to attract the attention or to retain the interest and sympathy of the person addressed, or may be used in the third person as a mere exclamation. The highly inflected languages of the Indo-European, while frequently using for this purpose the form of the nominative, have especially appropriated to it a form of the noun-stem without special case-ending, as Greek σῶτερ, Ἄπολλον, Σώκρατες, ἄδελφε. B. I. W.

Vode'na: town; in European Turkey, vilayet of Salonica, on the Vistritza. Though occupying the site of EDESSA (*q. v.*), there are few antiquities. Pop. about 10,000.

Vogel, fō'gel, ALFRED, M. D.: pædiatrist; b. at Munich, Germany, Mar. 31, 1829; son of the chemist Heinrich von Vogel; studied medicine at the Universities of Munich, Berlin, and Würzburg, graduating M. D. at the former in 1852; became docent in that university in 1855, and professor extraordinary in 1865; accepted a call to Dorpat University in 1866 to fill the professorship of special pathology, remaining there until 1886. While there he was decorated with several orders by the czar, and became a member of the privy council. In 1886 he returned to Munich to fill the post of honorary professor and president of the pædiatric clinic. His most important publication was *Das Lehrbuch der Kinderkrankheiten* (1860), which passed through eleven editions, and was translated into most of the languages of Christendom. D. Oct. 9, 1890. S. T. A.

Vogel, EDUARD: traveler; b. at Crefeld, Rhenish Prussia, Mar. 7, 1829; was educated in Leipzig; studied astronomy and natural science there and in Berlin under Encke; assisted Hind for two years in his labors at Bishop's observatory in London, and went in 1853 to Africa, with the support of the British Government, to join the expedition of Clapperton, Barth, and Overweg. Feb. 20, 1853, he sailed from England to Tripoli; Aug. 5 he reached Murzuk, and Jan. 13, 1854, Kuka, the capital of Bornu. From this place he undertook various expeditions to the adjacent countries; met Barth at Bundi Dec. 1, 1854; visited Yacoba, and returned to Kuka Dec. 1, 1855. At this date his own notes stop, but it was afterward ascertained that on Jan. 1, 1856, he started eastward, penetrated to Wara, the capital of Waday, and was assassinated there Feb. 8, 1856. His notes were published by his sister, Elise Polko, in her *Erinnerungen an einen Verschollenen* (Leipzig, 1853).

Revised by M. W. HARRINGTON.

Vogel, Julius, K. C. M. G.: statesman; b. in London, 1835; educated at London University School, and at the Royal School of Mines, where he gave particular attention to the assaying and testing of the precious metals; went to Melbourne about 1851, intending to put his knowledge to practical use in the gold-fields of Australia, but, becoming interested in politics, was elected a member of the provincial council; became head of the provincial government; also became a member of the New Zealand House of Representatives, removing to Auckland in 1869; was successively colonial treasurer, postmaster-general, commissioner of customs, prime minister (resigning 1876), and agent-general (1876–81) for New Zealand; again held a Government position in New Zealand 1884–88; then returned to England. He was instrumental in furthering immigration into New Zealand, the construction of railways, and the passage of the act for inscribing colonial stocks. He published a handbook of New Zealand, several pamphlets and papers, and a novel, *A. D. 2000*. D. Mar. 13, 1899.

Vogelweide, Walther von der: See Walther von der Vogelweide.

Vogesen: See Vosges Mountains.

Voghera, vō-gā'raä (anc. *Iria*): town; province of Pavia, Italy; in the rich and highly cultivated plain between the Po and the Apennines (see map of Italy, ref. 3–C). The Via Emilia passes directly through the town, which is also connected by railway with Genoa, Milan, etc. There are manufactures of hempen, linen, and cotton fabrics, and hats are exported even to America. The agriculture of the vicinity is prosperous. Voghera was settled before the Roman period, and was a place of some importance when destroyed by northern invaders early in our era. Its mediæval history is closely connected with that of Milan and Genoa. Roman antiquities are found in and near the town. Pop. 12,790.

Vogrich, Maximilian K. W.: See the Appendix.

Vogt, fōkht, Karl, M. D.: naturalist; b. at Giessen, Germany, July 5, 1817; graduated in medicine at Berne in 1833; in 1839 was associated with Agassiz in the publication of *L'Histoire naturelle des poissons d'eau douce de l'Europe centrale*; in 1847 became Professor of Zoölogy at the University of Giessen, a position which he lost a little later on account of his political opinions; in 1849 became Professor of Geology at the University of Geneva, and held the position until his death, which occurred at Geneva, Switzerland, May 6, 1895. He was the author of numerous papers and books on anthropology, comparative anatomy, geology, and zoölogy. Among his principal works are *Physiologische Briefe* (1845–46); *Lehrbuch der Geologie und Petrefaktenkunde* (Brunswick, 1846); *Ocean und Mittelmeer* (1848); *Die Säugethiere in Wort und Bild* (Munich, 1883). F. A. Lucas.

Vogüé, vō'gü'ā', Charles Jean Melchior, Marquis de: archæologist; b. in Paris, Oct. 18, 1829; studied the religious history and arts of the East; traveled in Syria and Palestine 1853–54, and was elected a member of the Academy in 1868 for his publications dealing with these countries. He was ambassador of France at Constantinople from 1871 to 1873, when he was transferred to Vienna. He was made a commander of the Legion of Honor in 1879. Among his works are *Les Églises de la Terre-Sainte* (1859); *Le Temple de Jérusalem* (1864–65); *L'architecture civile et religieuse dans la Syrie Centrale* (1865–77); *Mélanges d'archéologie orientale* (1869); *Inscriptions sémitiques* (1869–77).

Vogüé, Eugène Marie Melchior, Vicomte de: critic and historian; b. at Nice, France, Feb. 25, 1848; served in the Franco-German war; in 1871 entered the civil service in the Department of Foreign Affairs; became *attaché* at Constantinople in 1873, and secretary of legation at St. Petersburg in 1876; retired in 1882 and devoted himself to literary and historical work, contributing frequently to the *Revue des Deux Mondes*. He was chosen to the Academy in 1888. He has protested against the materialism and pessimism of recent currents of French literature, and was one of the inaugurators of the movement sometimes called neo-Christian. Among his works are *Syrie, Palestine, Mont Athos* (1876); *Histoires orientales* (1879); *Les Portraits du siècle* (1883); *Histoires d'hier* (1885); *Le Roman russe* (1886); *Souvenirs et Visions* (1887); *Heures d'histoire* (1893). A. G. Canfield.

Voice [M. Eng. *vois*, from O. Fr. *vois, voiz* > Fr. *voix* < Lat. *vox, vo'cis*: Gr. ὄψ, *Fόψ, voice: Sanskr. *vāc-*, speak; cf. Gr. ἔπος, *Fέπος, word, and Lat. *voca're*, call]: in the generic sense, a property of all living animals which are structurally endowed with a capacity to produce sounds uttered from the mouth; articulate voice, the organ of language, the vehicle of thought and feeling, belongs to man alone. The methods by which the intellectual attainments of any one member of the human family may thus become the possession of all are two—viz., *speaking* and *singing*.

These must have been almost coeval in their origin; for, as the deductions of reason prove that the social necessities of the race must have very early given rise to spoken language, so a universal experience unites with remotest tradition in ascribing to every human being a religious impulse which finds its most adequate expression in song. The least-civilized tribes have always celebrated their festivals of worship with rhythmic chants, while the cultivated nations of all time have cherished music as the ethereal medium of poetry and a potent agent in the culture of the soul. For the musical side of vocal art science has already done much by defining its forms and improving its processes. Mathematics and physics have expounded the laws of sound; philosophers have discovered the immutable principles upon which melody, harmony, and rhythm depend; and the definite nature of the work to be accomplished in giving force and expression to the singing voice has made it possible to conduct that work on a well-ascertained scientific basis. But to the cultivation of speech, a faculty normally universal, and hence much more intimate and important in its relations to man, its more complicated mechanical processes and the less definite character of its melodic scale have hitherto presented the most formidable obstacles.

The human voice may be treated from a physical, a physiological, and psychological point of view; in other words, we may consider (1) the instrument, (2) its mechanical uses and processes, and (3) those intellectual laws by which it is made to convey thought and emotion to the human soul.

I. Of the physical apparatus employed in the production of voice the merest outline of description must suffice. Any good manual of anatomy will furnish the inquirer with the detailed discussion he may desire. If we begin to construct the mechanism of the voice as we would build an organ (to which it bears some analogy), we find at the base, in the human chest, the lungs, which perform the office of a bellows to furnish air for the instrument above. This air is forced through bronchial tubes, which, extending upward through either lung, gradually converge until they meet in a single tube, called the *trachea*, or windpipe, consisting of incomplete cartilaginous rings lying horizontally one above the other. At the upper end of the trachea is a funnel-shaped piece of mechanism, enlarging upward and composed of various cartilages connected by ligaments, and moved by muscles. This is called the *larynx*. Through its center, in continuation of the air-tube, runs a passage, which terminates in a triangular opening. Across this passage are stretched two pairs of tense elastic membranes—the *chordæ vocales*. Of these, however, only the lower pair is immediately concerned in the production of tone. These are called, therefore, the true vocal cords. Between their fine edges there is a narrow opening or chink, called the *glottis*; and as these cords are at will made more or less tense, the wind that is forced through the opening causes them to vibrate audibly with various degrees of force and pitch.

This is the genesis of voice: from this point the tone here generated undergoes only modifications of fullness and quality and such as combine to effect articulation. The voice now passes into the *pharynx*, a membranous bag which leads both into the mouth and into the nose. The curtain of the palate hangs between the pharynx and the mouth. It rises as a valve to cover the inner ends of the nostrils for purely oral sounds, and it falls to uncover the same for nasal sounds. The pharynx, together with the space between the two constrictions of the larynx—the upper or false vocal cords and the lower or true vocal cords,—and the anterior cavity of the mouth, with the frontal cavities over the eyes and in the cheek-bones, constitute a resonance apparatus, a species of sounding-board, by which the voice is modified in respect to fullness and quality.

II. Sound comes to the ears in two forms—as *tone* and as *noise*. Tone is sound caused by the regular periodic vibrations of the sounding body, such as are given out by musical instruments. Noise proceeds from irregular vibrations of the sounding body. The crash of thunder, the rattling of street traffic, the discord which results from striking all the keys of a piano at once—these are noises. The sounds made in speaking consist of both tones and noises.

Helmholtz, in his *Lehre von den Tonempfindungen*, showed that for the production of every vowel-sound the cavity of the mouth is definitely tuned by the disposition of its various parts—the teeth, the tongue, the lips, the soft palate, the pharynx, etc. The air confined in the cavity of the mouth has, like any other body of confined air, its own rate of vibration, and hence its own pitch, which varies with the variation of the cavity. The vowel-sound, therefore, is independent of the musical tone produced by the larynx, and is always the same, whether in the mouth of man, woman, or child. This is true also of some of the consonant sounds, while others are merely noises produced by the breath vibrating at points of resistance in partly closed organs. Thus every element of language has its own peculiar type—or *Klang*, as it is called by the Germans—which distinguishes it from all others. These characteristic sounds may be heard even in whispering. In speaking aloud they are combined with the noises (also formed in the mouth-cavity) and supported by the tones of the larynx. Speech thus results from the combined working of two very different actions of the vocal organs. The difference between singing and speaking is that the first employs pure tones, each of definite pitch and level throughout its duration, and that the second employs unlevel tones which taper to a more acute or grave pitch at their termination. These speaking tones are called inflections. In speaking, noises predominate, and tone asserts itself mainly in occasional prolongation of the vowel-sounds.

Tone has three properties—strength, pitch, and quality, called by the Germans *Klangfarbe* (tone-color), and by the French *timbre*. The strength of a tone depends upon the amplitude, its pitch upon the rapidity, and its timbre upon the form of the vibrations which produce it. As the strength of the tone depends upon the breadth of the sound-waves, this, in its turn, depends primarily upon the structure, and then upon the disposition or adjustment, of the vocal organs and of the resonance apparatus. Much misdirected labor is sometimes expended in attempting to increase the power of the voice by straining exercise of its muscular organism. In view of the delicacy and tenderness of these ligaments such a process must be worse than useless. When once these parts are fully developed it is not possible in this way to make a strong voice out of a weak one. The tone may indeed be re-enforced by adding to the impulse which produces it a greater exertion of the diaphragm and abdominal muscles, and by a proper adjustment of the vocal cords and management of the breath; but the less of effort in the muscles of the throat and chest, and in the force of breath, the more will a sweet and agreeable quality be communicated to the voice, together with that reach and ring which comprise all the best effects of power.

The pitch of a tone depends upon the number of the vibrations in a given time by which it is produced: the more rapid the vibrations, the higher the pitch. Variations of pitch in the human voice are due exclusively to the action of the glottis and the ligaments of the larynx, and are subject to the uniform laws by which the tones in hollow tubes ascend or descend according to the different lengths of the air-columns they contain, and in stringed instruments according to the greater or less tension, the extent, and the degree of vibrating surface in their strings. By means of the LARYNGOSCOPE (*q. v.*) the various movements of the larynx and vocal cords have been accurately inspected and recorded. It is found that in giving forth the lowest tones of what is called the *chest-voice* the windpipe is enlarged to its utmost capacity, the vocal cords are moved throughout their whole length with large, loose vibrations, which are communicated to all the interior parts of the larynx, and, by resonance, to the confined air in the cavity of the chest. When to this is added a peculiar expansion of the pharyngeal cavity, that full, rich quality of the voice is produced to which Dr. Rush gave the name of *orotund*, and to which the dramatic artist is indebted for some of his finest effects. As the scale is ascended the vocal cords swiftly meet and separate at each new tone, and are shortened and made more tense; as the strings of a violin are controlled by the fingers of the player. The tones of the *head-voice* (as it is usually styled) are produced by vibrations of the inner edges only of the *chordæ vocales*. This, however, is but a general and imperfect view of a very complicated process, and makes no account of the expansion and contraction of the trachea, with the consequent rise and fall of the larynx, and some other important modifications; for it is of less importance at present to give an accurate description of the physiological processes than to expound the physical laws relating to them, in obedience to which the phenomena of voice are produced.

The division of the vocal scale into registers (chest-voice, head-voice, falsetto, etc.), their points of transition, and the treatment of the singing voice with regard to them, about which a wide difference of opinion exists, are less important in elocution, because the scale employed is more limited, little beyond the lower and a part of the middle register requiring cultivation, and that of a simpler character. Men speak (normally) an octave lower than women, employing usually only the chest-tones, rarely the head-tones, and never the falsetto. The usual range of the male voice is from the low F to A. Women use mostly the upper part of the chest register and the lower part of the falsetto, ranging from A below the line to B in the treble clef. Little children speak entirely in the falsetto.

The upper part of the chest register—that is, the middle voice—is best adapted to public speaking, being most capable of inflection, farthest of reach, and most easily sustained. If the voice is pitched too high, when excitement supervenes it will tend to break into a scream, while for low-keyed voices it is usually very difficult to rise out of a tedious monotony. The middle voice gets all the advantage from chest-resonance, and at the same time has room to rise or fall when emotion or occasion demands. The accomplished speaker should have full control over the pitch of his voice, and be able to modulate its key at will, so as to adapt it to all external circumstances.

The increase of the compass of the voice is not so important in elocutionary as in musical instruction. A judicious practice of the scale under the guidance of a skillful master will accomplish all that is necessary in this respect, and at the same time tend to improve the voice in flexibility and purity.

The most important thing to be considered in the culture of the voice is timbre or quality. All bodies and instruments employed for producing musical sounds give forth, besides their fundamental tones, certain other tones due to higher orders of vibration. It is the intermixture of these with the fundamental tone which determines the *quality* of the sound and distinguishes instruments from each other—a clarinet from a flute (for example), both these from a violin, all of them from the human voice, and different voices from one another. These are the *harmonics* of the fundamental tone—called by the German physicists the *harmonic overtones*. Though feeble in comparison with the primary tone, they may, with a little practice and attention, be heard when, for instance, one of the lower notes is struck upon a pianoforte. Above every tone of a determined pitch may be traced a whole series of "harmonic overtones," rising according to the "acoustic series" before indicated—viz., first the octave, then the fifth, etc.

The timbre of a tone, as has been said, depends on the *form* of the waves of vibration. As the surface of water is moved into waves of a different form according to the object which agitates it—whether a falling stone, a ruffling wind, or a dividing keel—so the movements of the air take different shapes according to the way in which they are excited, whether by the violin-string under the rasp of the bow, the harp-string plucked by the finger, or the reed of the clarinet vibrated by the breath. These varieties are infinitely numerous, and are distinguished by the different relations which they cause between the fundamental tone and the overtones. The most beautiful timbre is found to result from that form of the vibratory waves which produces the primary and its harmonics in the intervals of the major chord to the sixth above, the former sounding most loudly and the latter gradually decreasing. As the overtones increase in strength in relation to the fundamental tone, the sound grows shrill; and if the higher overtones, which lie close together and are dissonant, overpower the fundamental, the quality of the sound becomes harsh and disagreeable.

The timbre of the voice depends on the manner in which the tone begins, the management of the breath in producing it, the direction given to the column of air which carries it, and the disposition of the anterior cavities by which it is tuned for the various elements of speech. It has been found that the form of vibration most favorable to a pleasing as well as far-reaching quality of voice is a *round* form—i. e. one which sends the sound-waves out upon the air in such a way as to allow of their circulation in all directions with the least obstruction; and that this form is best produced by a light, elastic impulse, like that made by the sudden

fall of a pebble into the smooth surface of a lake—with the difference that sound spreads out in the air like a sphere, while the waves of water extend only in circles. This light impulse is to be accomplished by a careful adjustment of the vocal organs, so as to allow just the quantity of breath to escape which is necessary for the production of the tone. If too little breath is used, the vibrations will be feeble; if too much, the vibrations will be distorted from the form most favorable to an agreeable and effective quality. An excessive pressure of the breath drives the sound-waves forth in a single direction, instead of allowing them to expand, and the low harmonic overtones disappear, while the high dissonant overtones disagreeably assert themselves. Every particle of the column of air expired should vibrate, or of course it is lost to sound; besides that, the escape of unvocalized along with the vibrating air makes itself manifest in a certain wheezing very detrimental to the purity of the tone. The first impulse of the voice, then, should be sudden, light, and made with a moderate expenditure of breath. By this method the sound takes on a round and even form, which may be by due precautions maintained and the timbre kept always at its best; while the same process is most favorable also to the reach of the sound, as more speed and power can be generated by a quick, elastic blow than by the steady pressure of a heavier force.

Again, both theory and experience teach that, for purposes of purity in tone, the air-column from the larynx should be directed, both in speaking and singing, to the front of the mouth, and concentrated there above the upper teeth, whence it should rebound to form continuous vibrations in the various resonance apparatus behind. If this rebound takes place farther back the inharmonic overtones become prominent, and various discordant qualities result. Among the well-known faults of vocal quality—such as nasal, guttural, husky, thin, strained, metallic—the greater part have too often been deemed organic and unalterable, but they are (with the exception of rare instances of structural defect) due to misuse of the vocal apparatus, and may, by proper treatment, be greatly modified or entirely obviated.

Finally, the form given to the mouth-cavity, by which it is tuned for the elements of articulation, has not a little influence on the timbre of the voice. For, however excellent the tone may be in its origin, the form of the vibrations—on which, as we have seen, the quality depends—must be affected by the passages through which they proceed on their way to the lips. Care must always be taken to give room in the mouth-cavity for the proper formation of the vowel by expansion of the faucal passage; for the more room given for vowel-sounds, the more will musical tones predominate, and the richer, fuller, and sweeter will be the utterance. So true and so important are these injunctions that it has been said that the quality of a good voice has its origin in the mouth-cavities rather than in the vocal cords, as commonly supposed.

One of the most wonderful and interesting results of scientific voice-culture may be seen in what it has accomplished for the instruction of deaf mutes. The occasional attempts hitherto made by these unfortunates to utter speaking sounds have resulted only in discordant tones, entirely uncontrollable in the essential particulars of pitch and quality; but by many years of minute investigation and unwearied experiment, assisted by an ingenious system of diacritic symbols, Prof. A. Graham Bell, of Boston, has been enabled to teach the deaf not only to produce all the sounds of speech, but to appreciate and to modify the quality of their voices, to sustain or to vary the pitch, and, in short, to fulfill all the conditions of a correct and pleasing utterance. The symbolic system alluded to was invented by Prof. A. Melville Bell. It is called VISIBLE SPEECH (*q. v.*), and consists of a series of signs which indicate, by their form, the exact method by which all the sounds possible to human speech must be produced.

III. It remains to consider speech psychologically: as the medium of expression, the vehicle of thought and emotion. If we view the vocal elements combined in syllables and words and sentences as constituting the form of the art, we inquire now after the animating spirit which is to imbue that form with beauty and power. This influence is to be found, primarily and comprehensively, in the largest general culture—intellectual, æsthetic, moral. Cicero demanded for the orator the most consummate and various wisdom, and Quintilian contended that he should be also a good man; and even for the reader or the actor, who but embodies in his utterance the sentiments of another, it is clear that intelligence and sensibility to appreciate the language he employs is absolutely indispensable to the successful performance of his task. This psychological fitness makes itself immediately felt in an infinite variety of vocal inflections, some of them so minute as to defy analysis and almost to elude observation. These subtle phenomena some elementary writers have endeavored to classify, but, while the attained results are undoubtedly valuable to students, the rules for the modulation of the voice can not be consciously carried into actual delivery. Indeed, they are not intended to be so; their object is merely to cultivate the vocal powers and to open the mind to a recognition of the possibilities of expression. Notwithstanding the nearness of the subject to all human interests, it is not to be denied that the formal study of elocution as a branch of education has never been popular. There is a latent suspicion in the common mind that the subtleties of thought and emotion, and the innumerable varieties of vocal inflection which are the exponents of these, are incapable of analysis and mechanical production; that they must result from the intuitive agency of the intellect and the heart; and that without this spontaneous energy no artificial system is competent to create them. If the culture of delivery, according to the supposition of Archbishop Whately, the eminent formulator of the doctrine of *laissez aller* in this branch of rhetorical study, necessarily involved the careful attention of the speaker, *while in the act of speaking*, to rules of tone, emphasis, and inflection, the question would be answered in the statement of it. But the technique of this, as of all other arts, is to be taught and wrought into a habit, so that the learner comes to conform to its minutest requirements automatically. The test of excellence in this art, more than in any other, is the concealment of all artifice, and any disclosure by speaker or reader of his technical sub-processes is fatal to success. On the other hand, it is not easy to see why this, more than any other art, should be held as entirely independent of technical knowledge and skill. Notwithstanding the elaborate effort of the distinguished critic in question to show a difference between this and the art of composition, it appears to the writer that the analogy is complete, and that his objection holds equally good against the study of the rules of grammar and rhetoric, which would doubtless prove mere impediments to the orator who should make conscious use of them in the pulpit or on the rostrum.

On the other hand, it must be acknowledged that there has been a tendency in elocution, as usually taught, to fix the attention of the pupil too exclusively upon a prescribed set of modulations, apt to become mechanical, and so to shut the avenues of his soul against that infinite variety of delicate suggestions which nature is wont to make to cultured sensibility, and which can never be reduced to system. The question has been asked "What distinction of grave, or acute, or circumflex, for example, can inspire the actor to the proper utterance of the *Et* TU, *Brute?* of the dying Cæsar, adopted from Plutarch by Shakspeare? Here is a single word the just delivery of which all the systems of all the schools can never define." The answer to this question is that notations for expression furnish a means of varied exercise in different modes of delivering the same language, and that the student does not merely follow a prescribed set of modulations, but simply from them acquires the ability to govern his voice in any way his judgment may approve. We may at least admit that no analysis of the voice in delivery can be exhaustive, or be allowed to supersede a constant fresh application to the oracles of nature for inspiration to the best utterance.

Attempts have been made at different times, both in the U. S. and in Europe, to define and regulate expression by intervals identical with those which exist in music, and to indicate the modulation by musical notation. One of the most eminent of these theorists was Dr. James Rush, of Philadelphia, who in 1827 published a *Philosophy of the Human Voice*, and who deserves mention as one of the first in the U. S. to give impulse to the investigation of this subject, and for the many valuable contributions to the art of vocal culture which his work contains. This writer, having observed the diphthongal character of some of the vowels, gave the name of *radical* to the first and of *vanish* to the latter of the two elements, and asserted that the voice spans the interval of a musical tone in passing from one to the other. From this he proceeded to construct the theory that all the intervals of speech may be determined by musical analogies; and he elaborated a system by which all the

variations of the voice, in every phase of expression, may be measured by the degrees of the musical scale and marked by a quasi-musical notation. This theory was advanced before the more thorough investigations of modern science had better explained some of the imperfectly observed facts on which it rests. Its practical value may be estimated by the fact that not one of the notated phrases by which it is illustrated can be read by the musical symbols without first appealing to the independent action of the mind for a key; and also by the fact that of all the teachers who have professed to base their instruction upon the *Philosophy* of Dr. Rush, not one, apparently, has ever made a serious and persistent attempt to carry this portion of it into practice. It is but just to add that all through his rather voluminous work are scattered valuable suggestions of a general nature, and that his analysis of the vocal elements has been found useful for the acquisition of a correct and forcible utterance.

There is another system which is less open to the objection of artificiality. It is that which derives the law of delivery from the structure of the sentence. This idea was first advanced by Walker in his *Elements of Elocution*, but its fuller development was reserved for Dr. Henry Mandeville, of Hamilton College, New York. The latter carried out the principle of modulation based upon sentential structure (not forgetting the special influence of emphasis, of which he presents an acute and exhaustive discussion) through a very wide induction of sentences selected from English literature. This method of instruction, in causing the arts of composition and delivery to go hand in hand, restores elocution to its ancient dignified alliance with rhetoric. But rules for delivery founded on sentential construction are not to be accepted as sufficient guides; for the fact is patent that grammatical constructions of any given kind may require very opposite expressions in different cases. Thus interrogative construction may require to be pronounced assertively and *vice versa*. The governing principle is rather that the meaning intended to be conveyed dictates the method of delivery, irrespective of sentential construction. The laws of vocal expression are in this way proved to be the true regulators of delivery. Hence is obvious the paramount importance of the cultivation of the voice, and the mastery of its movements.

The whole matter of the advisability of formal education in elocution may be summed up in the well-worn maxim of Ovid: "The safest path lies midway of extremes." The true doctrine is thus well expressed by another: "To be able to act upon the souls of men with an elevating and informing power, it is first of all necessary that an artist should cultivate the form of his art to its greatest possible perfection, and have such perfect command of it that the practical application of it is as natural to him as to breathe. For, empty and dead as all technical knowledge is unless it is animated with a soul, yet no product of art æsthetically beautiful is possible without a perfect *technique*."

For details, see Helmholtz's *Lehre von den Tonempfindungen*; Dr. Oscar Wolf's *Sprache und Ohr*; Carpenter's *Human Physiology*; and the writings of Max Müller, Czermak, Du Bois-Reymond, etc.; for popular reading, Tyndall's *Lectures on Sound*; Emma Seiler's *The Voice in Singing* and *The Voice in Speaking*, which present the results of scientific investigation so far as practically valuable to the ordinary student; also Dr. Mandeville's *The Elements of Reading and Oratory*.

Revised by ALEXANDER MELVILLE BELL.

Voice (in music): The singing voice is divided into six classes, viz., three female, SOPRANO, MEZZO, and ALTO, and three male, TENOR, BARYTONE, and BASS (*qq. v.*). The mezzo-soprano, as the name denotes, is a voice of not quite so high a range as the true or high soprano, but generally counterbalances this by a few added low notes, and not infrequently by a richer quality in the middle range. In like manner all the various species of voice approach each other in some one direction, so that the specific name does not signify a given limit of compass as applied to each and every individual. Thus the barytone as a familiar division between true tenor and true bass is not infrequently subdivided by the Germans and spoken of in given instances as bass-barytone and tenor-barytone. There is also a difference among tenors, as the *tenore leggiero* (light tenor) and the *tenore robusto*. The difference between the two, however, lies rather in the volume and force of the latter voice than in a difference of compass.

DUDLEY BUCK.

Voice (in grammar): See VERB.

Voice, Loss of: See APHONIA.

Voir Dire, vwăăr-deer', [O. Fr., to say the truth; *voir* < Lat. *ve'rus*, true + *dire* < Lat. *di'cere*, say]: in law, an ancient technical term derived from the Norman French, and denoting the preliminary examination of a witness or juror on a judicial trial in order to ascertain whether he is competent. At the common law no person pecuniarily interested in the event of a suit was eligible as a witness on the side where his interest lay. If an individual was called on a trial and offered as a witness, the other party, suspecting him to be interested, might require that he should be specially sworn and examined touching his interest. This preliminary proceeding was called an examination on his *voir dire*, or simply the *voir dire*. By modern statutes the incapacity resulting from interest has been almost entirely abolished. The *voir dire* examination, therefore, if used at all, must be for the purpose of ascertaining other grounds of incompetency whenever and wherever any such exist. The practice survives mainly and is of the most practical utility at the present time in ascertaining the competency of jurors in criminal cases, though it is, as thus employed, liable to great abuse.

Revised by G. W. KIRCHWEY.

Voisin Bey, vwăă'zăń'bā', FRANÇOIS PHILIPPE: civil engineer, inspector-general of bridges and highways; b. at Versailles, France, May 20, 1821; entered the École de Ponts et Chaussées in 1840; was ordinary engineer in 1846, chief engineer in 1866, and inspector-general in 1880; director-general of the works of the Suez Canal from 1861 to their completion in 1870; Professor of the Course on Maritime Works at the École de Ponts et Chaussées from 1873 to 1881. He has published *Ports de Mer* (1883; Germ. trans. by Franzuis, director of imperial maritime constructions and professor at the Maritime Academy of Kiel) and *Notice sur les travaux à l'embouchure du Danube* (1893). He is an officer of the Legion of Honor.

W. R. HUTTON.

Vokes, ROSINA: actress; b. in London, 1854. She was the youngest of the company of actors known as the Vokes family, consisting of Frederic and his sisters, Jessie, Victoria, Rosina, and Fawdon Vokes, the latter's real name being Fawdon. From childhood they all had a taste for the stage. They learned elocution and stage action at Plymouth, England, joined a pantomime troupe, and met with success throughout Great Britain, making their professional *début* in London at the Lyceum theater in *Humpty Dumpty* Dec. 26, 1868. The Vokes family crossed the Atlantic a number of times. The most successful of their pieces was *The Belles of the Kitchen*. The company played in every city of importance in Great Britain, Ireland, the U. S., and Canada. In 1877 Rosina Vokes was married to Cecil Clay, an English barrister, and retired from the stage for several years. In 1886 she organized a company and visited the U. S. regularly every season, playing farces and short comedies in all the principal cities. D. at Torquay, England, Jan. 27, 1894.

B. B. VALLENTINE.

Volapük, vō-lăă-pük', [world's language; *vola*, genitive of *vol*, world + *pük*, language, words fashioned after English *world* and *speak*]: an artificial language invented by a clergyman, Johann Martin Schleyer, of Litzelstetten, in Baden, and given to the public in 1879. It first spread to Austria, and a society was formed for its propagation in Vienna in 1882. It was also studied extensively in Holland, Belgium, and especially France, but was not so successful in English-speaking countries. Its purpose was to facilitate ordinary intercourse between peoples of various tongues by affording a linguistic medium purged of all the irregularities and inconsistencies which characterize natural or traditional speech. Basing in general upon the English, it sought to utilize the convenient uniformity of the agglutinative type of languages, especially in regard to word-formation. The number of those who have studied the language has been estimated at over 200,000, and there have been many periodicals devoted to the interests of Volapük, and printed in that language.

Sounds of Letters.—These have in general their familiar continental values, but c = Eng. j in *joke*, h = Germ. *ch* in *ach*, j = Eng. *sh* in *she*, v = Eng. w in *wet*, y = Eng. y in *yet*, z = Eng. *ts* in *hats*. The sound h is denoted by the Greek *spiritus asper*, as *'ap*, harp; c' = Eng. *ch* in *child*. Words are accented on the final syllable.

Word-formation.—Words are formed from monosyllabic roots which themselves often serve as words. Derivatives

are formed by the use of prefixes and affixes of constant value, possessing entire monopoly of their office. Thus:

not, information.	*pen*, pen.	*lab*, possession.	*jep*, herd.
notik, public.	*penik*, feathered.	*labik*, mighty.	*jepik*, in flocks.
notön, announce.	*penön*, to write.	*labön*, possess.	*jepön*, to watch.
notel, informer.	*penel*, writer.	*label*, possessor.	*jepel*, shepherd.
notam, N. B.	*penam*, the writing.	*labam*, the taking.	*jepam*, protection.
notad, publication.	*penad*, writing.		
noted, remark.	*pened*, letter.	*labed*, property.	

The prefix *lu-* indicates weakened or debased quality; thus *sanel*, doctor; *lusanel*, quack; *vok*, sound, voice; *luvok*, shriek; *man*, man; *luman*, rascal. The prefix *le-* magnifies, as *jul*, school, *lejul*, university; *dom*, house; *ledom*, palace. Diminutives are formed by adding *-il*, as *bod*, loaf; *bodil*, small loaf; *kat*, cat; *katil*, kitten. Comparatives end in *-ikum*, superlatives in *-ikün*, as *dib*, depth; *dibik*, deep; *dibikum*, deeper; *dibikün*, deepest. Feminine names are formed from the corresponding masculines by prefixing *ji-* (pronounced *she*), as *fat*, father; *jifat*, mother; *gam*, bridegroom; *jigam*, bride; *blod*, brother; *jiblod*, sister.

Inflexion.—The inflexion of nouns is as follows:

	Singular.	Plural.
Nom.	*buk*, book.	*buks*, books.
Gen.	*buka*, of a book.	*bukas*, of books.
Dat.	*buke*, to a book.	*bukes*, to books.
Acc.	*buki*, book.	*bukis*, books.

The pronouns follow the nouns both in formation and inflexion, thus *ob*, I; *om*, he; *obs*, we; *oms*, they; *obik*, my; *omik*, his; *obsik*, our; *omsik*, their.

The inflexion of the verb may be illustrated by the following examples:

Present.	Imperfect.	Perfect.	Pluperfect.	Future.
löfob, I love.	*alöfob*.	*elöfob*.	*ilöfob*	*olöfob*.
löfom, he loves.	*alöfom*.	*elöfom*.	*ilöfom*.	*olöfom*.
löfobs, we love.	*alöfobs*.	*elöfobs*.	*ilöfobs*.	*olöfobs*.

Optative (3 sing.), *löfomös*; imperative, *löfomöd*; infinitive, *löfor*; participle, *löföl*.

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BENJ. IDE WHEELER.

Volatile Oils: See ESSENTIAL OILS.

Volcanism: See GEOLOGY.

Volcanoes [from Ital. *volca'no*, volcano, orig. the volcano of Mt. Etna, fabled to be the abode of Vulcan, the Roman god of fire and the lower world < Lat. *Vulca'nus*, Vulcan]: (1) openings in the earth from which molten lava or other highly heated substances are discharged; or (2) mountains or hills from which such substances are or have been discharged. The typical shape of a volcanic mountain is a truncated cone, the apex being replaced by a conical cavity called a crater; but the form is often less simple. At the bottom of the crater is the opening, or vent, from which the discharges or eruptions usually take place. The body of the volcano is composed of erupted material which accumulates about the vent, gradually building up the conical mass.

PHENOMENA OF VOLCANIC ACTIVITY.—*Effusive Eruption.*—A large part of the material discharged from a volcano is liquid or pasty, consisting of melted rock or lava. The kinds of rock which are erupted differ from the ordinary stratified or sedimentary rocks in composition and structure. They are composed chiefly of silica and various silicates, which are sometimes amorphous or glassy, but more commonly crystalline. (See ROCKS.) The varieties containing much silica are said to be *acid*, those with comparatively little silica *basic*. The basic varieties are heavier than the acid. They are also more fusible and as a class they are darker. When erupted a basic lava is heated much above the temperature of fusion, so as to be quite liquid. It flows down the slopes adjacent to the vent in a thin stream, or if issuing on a plain spreads into a broad lake. As it flows the superficial part is rapidly cooled and a solid crust is soon formed. This crust may move onward with the current, in which case it is rolled under it at the end, or it may adhere at the sides and become fixed, permitting the liquid portion to flow on beneath it. The liquid by cooling is gradually rendered viscous, and at the extreme point to which it flows is usually so stiff as to hold a wall 30 or 40 or even 100 feet high. Sometimes the crust of a narrow stream will become so strong as to be self-supporting, and the liquid beneath may then flow out from under it, leaving a cave or tunnel.

An acid lava usually issues in a pasty or viscous condition, flows but a short distance, and comes to rest in a sheet several hundred feet in thickness. Sometimes it does not flow at all, but remains in a bulbous mass over the vent.

Each eruption adds a layer of solid lava to the country adjacent to the vent. Where a series of eruptions take place from the same vent, each successive discharge flows toward the lowest tract, and in this way the country is built up somewhat evenly on all sides, the result being a conical mountain. Usually after an eruption the liquid lava retreats down the funnel, leaving a crater at the top of the cone, but acid lavas sometimes produce dome-like mountains without craters.

Expulsive Eruption.—Molten rock when subject to great pressure is able to absorb much water in the form of steam, and a certain amount of moisture is contained in all lavas. It is only those in which the quantity of steam is small that well out quietly, as described in the preceding section. When a large quantity of steam is present the phenomena of eruption are very different. As the lava rises toward the surface the pressure on it becomes gradually less, and the diminution of pressure affects the condition of the steam. Under great pressure it is dissolved or occluded by the lava, and is inert; under small pressure it exhibits the elasticity characteristic of gases, and expands. Thus as the lava approaches the surface it becomes filled with bubbles and these bubbles continually grow. The lava is thereby made lighter and its upward motion is increased. Arriving at the surface it is torn to fragments by the steam, and these fragments are thrown high in the air. In the extreme case they are so fine as to constitute a dust which is floated off by the wind and descends gradually to the earth, covering a large district with a thin sheet. Usually the fragments are larger and fall to the ground near the vent. They may be in a pasty condition, so as to adhere, or they may have cooled in their transit through the air so as to accumulate in a loose heap. They are more or less spongy in structure, being filled with bubbles, and for this reason they are ordinarily called cinders, or, when minute, ashes.

The cinders are thrown some hundreds or thousands of feet into the air, and on descending fall upon a circular tract about the vent. The vent itself receives no deposit, as the particles falling toward it are thrown back by the rising steam, and the accumulation is thus given the form of a ring with the vent in the center. From the crest of this ring there is a steep slope toward the vent, and all particles falling on this slope roll into the vent, to be again thrown

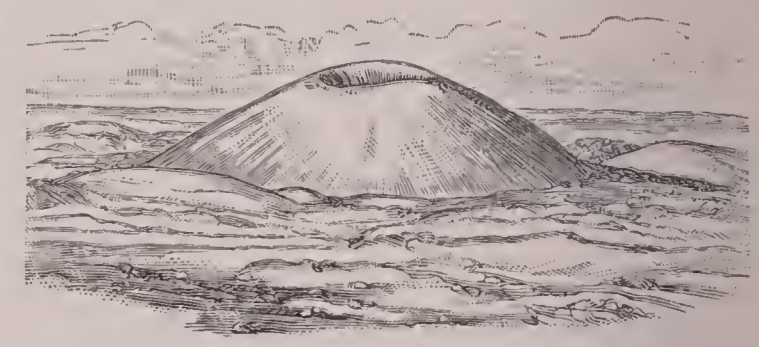

FIG. 1.—A cinder cone of the Franciscan group, Southern Arizona. Fresh lava stream near base at right.

out. There is also a steep slope outward which joins the surrounding plain by a curve. The cratered cone thus formed is known as a cinder cone, and is one of the most frequent results of eruption.

When the quantity of steam in the lava is moderate, the bubbles forming within the liquid at some distance beneath the surface gradually coalesce, making great bubbles which rise and burst with violence, throwing up fragments of the viscous and frothy films that surrounded them, and thus building up the slopes of the cone.

The tendency of the escaping steam to rise and of the ejected cinders and ashes to fall, ordinarily leads to their rapid separation, so that the deposit on the cone is dry; but it sometimes happens that the steam is soon condensed to rain which falls on the cone, and is thus reunited with the solid discharges, constituting a mud which flows down the slopes.

While a mountain is in strong expulsive eruption a continuous column of steam and dust rises from its crater to a height of several thousand feet, and then, having reached an air stratum of its own density, spreads as a horizontal cloud or is drifted away by the wind. Its color is black or white, as dust or steam predominates. About the column stones are seen to fall, and from the cloud may fall a shower of dust or

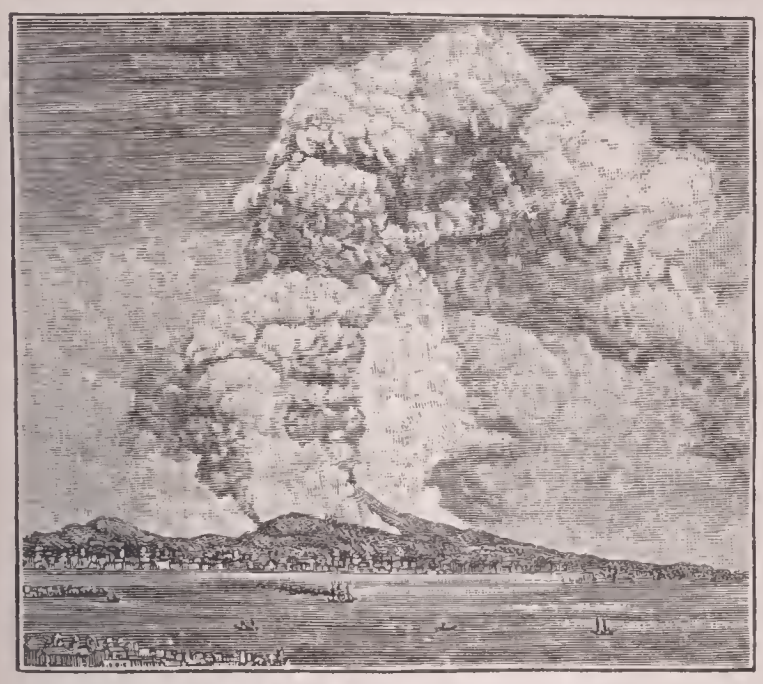

Fig. 2.—Vesuvius in eruption, April 26, 1872.

rain. At night the column and cloud are lighted up by the glow from the crater, and flying stones within the column are seen to be self-luminous.

Explosion.—Yet another phase of volcanic activity is exhibited when lavas rising through the crust do not actually reach the surface, but stopping at some lower point heat the water contained in the adjacent rocks far above the temperature at which, under ordinary conditions, it is converted into steam. This conversion is prevented by the weight of the overlying rocks, and also by their strength, until a large amount of energy is thus stored and concentrated. When at last the rocks above yield to the strain and are broken, the steam is suddenly expanded, producing an explosion. The underlying rocks are torn out, leaving a crater, and the rocks which were saturated by superheated steam are torn to powder and thrown high into the air. The explosion of Krakatoa in 1883 was one of the most notable catastrophes of this class, the finer dust being carried to the upper layers of the atmosphere, where it floated for many months, producing red skies that were observed throughout the world. See Krakatoa.

Rhythm and Alternation.—In various ways volcanic activity is rhythmic. Most volcanoes have periods of absolute rest and quiet, during which the subterranean conduits are sealed by the congelation of the lava. These periods are often so long that traditionary history retains no record of their beginning, and the catastrophes in which they sometimes terminate are the more disastrous because unsuspected. It is usually after such an interval that the most violent explosions occur.

During active periods the degree of activity varies from day to day and from year to year. The bursting bubbles are larger and smaller, more frequent and less frequent, and for a time they may cease altogether, the crater retaining only a pool of hot lava in gentle ebullition. The pool may rise until it overflows the rim of the crater, or it may retreat far down the conduit. The size of the conduit varies, becoming smaller by growth of its solid walls when the activity is feeble, and growing larger by fusion of its walls when activity is vigorous. Sometimes the pool expands into a lake, eating its way into the body of the mountain.

From large volcanoes effusive eruption is not always over the crater rim. The pressure from the lava column and the stresses from unequal heating may crack the mountain, letting the lava escape from the flank. The lateral discharge draws down the pool in the crater, and may continue for a long time, but eventually the cracks are sealed, and the lava again rises in the crater.

Still further variety is given by the alternation of different phases of activity. There are many vents which have yielded but a single eruption. Sometimes that eruption has been explosive, sometimes effusive, and sometimes it has changed during its progress from the expulsive to the effusive type. There are also a few localities at which the only volcanic event has been an explosion. Often, however, eruptions recur at the same spot, or so nearly at the same spot that the discharged material combines in the formation of a single volcanic mountain. In such cases the successive events are rarely of the same type. Effusion and expulsion alternate, and a long period of rest is apt to be ended by an explosion, partially destroying the heap already accumulated. Within the great crater of explosion new cones are built by expulsion and effusion, and these cones may eventually grow so large as to bury the remnants of their predecessors.

Accessory Phenomena.—For a discussion of earthquakes, which often precede the renewal of eruption, see Earthquakes. These are sometimes accompanied by the drying up of springs and wells. After each principal epoch of a volcano's activity, and also at the close of its life, the slow dissipation of the heat within it is manifested in various ways at the surface. Springs in the vicinity are apt to be thermal and highly charged with minerals in solution. Sometimes they take the form of geysers. In craters and near the summits of volcanic mountains, steam or warm moist air may issue from crevices, or there may be extensive chemical reactions resulting in the decomposition of rocks, the concentration of various minerals, and the escape of acid gases.

Distribution of Volcanoes.—Prof. Judd estimates the number of great habitual vents at from 300 to 350. If to these are added the volcanic mountains whose slopes show so little erosion that the date of latest eruption can not be more than a few centuries ago, the number is perhaps doubled, and it is still more greatly increased if there be added the subsidiary vents on the flanks of great volcanoes, and minor vents of brief activity.

There are volcanoes in all the great divisions of the world; the eastern hemisphere contains about as many as the western, the northern as the southern. But their distribution in detail is far from equable. They are gathered in groups or lines, and these are arranged in belts or systems, so that in a general way the surface of the earth may be classified in volcanic districts and non-volcanic districts. This classification is rendered more definite by including with active volcanoes all those which have perfect craters, or are otherwise so well preserved as to indicate somewhat recent activity. More than one-half the whole number constitute islands of the ocean, or occur on islands of moderate size, and of the remainder by far the greater number occur near the shores of the ocean. One of the principal belts surrounds the Pacific Ocean. Starting at the South Shetland islands it may be traced along the western coast of South America, Central America, and North America, and through the Aleutian islands, Kamchatka, the Kurile islands, Japan, Formosa, the Philippines, the Moluccas, Solomon islands, the North Hebrides, Kermadec islands, and New Zealand, to South Victoria Land. Within this circuit the Ladrone, Hawaiian, Galapagos, Samoan, Tonga, and Fiji archipelagoes, beside many smaller groups, are volcanic, and with them may be classed the coral islands of Polynesia, which probably rest in great part on volcanic foundations. From the Moluccas a branch belt extends eastward by way of the Banda islands through Java and Sumatra. The margins of the Atlantic are comparatively free from volcanoes, the principal exceptions being the Antilles, off the coast of South America, and the Canaries, off the coast of Africa. An irregular, submerged ridge traversing the Atlantic Ocean from north to south bears the volcanic mountains of Jan Mayen, Iceland, the Azores, the Cape Verde islands, Ascension, St. Helena, Tristan da Cunha, and at the extreme south the Sandwich islands. Between Ascension and the Cape Verde group there have been several submarine eruptions. The volcanic belt of Europe follows the shore of the Mediterranean, and is continued in Eastern Asia in the mountains of Armenia and Western Arabia. There is a belt of extinct volcanoes near the Persian Gulf, and a few active and extinct volcanoes are reported in Tibet and Manchuria. The principal groups of the Indian Ocean are on the Mascarene and Comorin islands, and Madagascar, and there is an important though straggling chain of volcanic islands along the borders of the Indian and Southern Oceans. In Australia, in the central and eastern parts of North America and South America, and in Northern Asia there are no volcanic districts.

In the geologic ages volcanoes appear to have been quite

as abundant as now, and their distribution was so varied from period to period that it is fair to assume there is no part of the earth's surface which has not at one time fallen within a volcanic district. In the U. S. there were extensive eruptions about Lake Superior in Algonkian time. During and after the deposition of the Newark system there were many volcanoes along what is now the eastern seaboard from Connecticut to South Carolina. In the Cenozoic era the mountainous regions W. of the Great Plains was characterized by great volcanic activity.

THE QUESTION OF CAUSE.—The stores of volcanic material manifestly lie many miles below the surface of the earth. The cause of volcanic action, having its seat in regions remote and inaccessible, is shrouded in mystery, and attempts to discover it have been far from satisfactory. In early days, when the properties of matter were little known, it was easy to believe that the heat exhibited by volcanoes had its origin in fire. The black cloud of dust and the illumination of its rising column by the glowing lava of the funnel were readily mistaken for smoke and flame, and the imagination completed a theory by peopling the nether regions with blacksmith gods. In the early days of chemistry it was discovered that certain substances might be produced by the union of oxygen with metals and that great heat was evolved in the process, and for a time volcanoes were ascribed to combustion of this character. When, however, it became fully understood that there is everywhere downward increase of temperature, and that the interior of the earth must be exceedingly hot, the apparent necessity for the production of heat disappeared, and theories of combustion were supplanted by others. The abundance of volcanoes near the shores of the sea, and the abundance of steam in volcanic discharges gave rise to a theory that water was the cause of eruption, the hot rock of the earth's interior being in some way rendered eruptible by the access of water. This idea for a time prevailed, and is still widely entertained, but serious difficulty is found from the consideration of two facts: First, that there are some volcanoes hundreds of miles not only from the sea, but from all other large bodies of water; second, that some lavas contain only a minute quantity of water, the amount being so small that it manifestly can play no important part in the chemistry or physics of eruption. Steam, indeed, has much to do with many volcanic eruptions, and is essential to explosion and the process of expulsive eruption, but the fact that it is not always present in notable quantities shows that it is not a factor essential to the uprising of lava.

In the judgment of the present writer an important step toward the understanding of volcanism was made by Clarence E. Dutton in pointing out a condition imposed by gravitation. Gravity is a feeble force, so feeble that it is overcome by all others in the various dynamic processes which pertain to the modification of the earth's surface, but in subterranean processes the masses involved are enormous, and gravitation, which is proportional to mass, acquires the highest importance. It is gravitation that gives general form to the earth, and all the greater features of continent and ocean bed are conditioned by its law of equilibrium. Strength of material is in comparison a vanishing quantity. It results from this general fact that a great body of molten rock which is lighter than the earth material above is powerfully urged to change its position by rising through the upper rock and spreading over it at the surface. If a conduit is open the rising of the liquid is inevitable, and if no way is open the liquid may be able to make one. On the other hand, a liquid which is heavier than the material above has no tendency to rise through it, and will not rise even if a passage is open. If urged by stresses originating elsewhere, it will lift the ceiling of its chamber instead of passing through it. It is therefore essential to volcanic discharge not merely that the lava be liquid, but that it be relatively light, and all volcanism is thus conditioned by a quasi hydrostatic law. As eruptions not only begin but end, it follows that each eruption results from some change of condition whereby a limited quantity of subterranean material is fitted for upward flow. The change of condition may be liquefaction, or it may be the expansion of a rock already liquid. The introduction of this condition does not solve the problem of the volcano, but changes its character, limiting inquiry to the mode in which rocks are rendered eruptible.

Several suggestions have been made of possible causes for the change in the condition of rock: (1) It is possible that some chemical reaction or the addition of water renders rocks fusible or lighter. (2) Of the same tendency, and more readily comprehended, is the addition of heat. It has been suggested that the temperature of subterranean tracts may be made to rise by the addition of deep sediments above. As the temperature of the surface is maintained nearly constant by radiation, a heavy sedimentary deposit would act as a blanket, and cause a rise of the isogeothermals. (3) Heat may be produced dynamically in connection with diastrophic movements. Whatever the process by which mountains are made and the heights of continents are changed, great stresses and strains arise, and wherever strains are relieved heat may be evolved. (4) Heat may be produced by tidal action. The differential attraction which produces oceanic tides must also produce bodily tides of the earth and a corresponding system of strains. If it be true, as some physicists have inferred, that the nucleus and outer crust are highly rigid as compared to an intermediate zone, then tidal stresses may accomplish work in the intermediate zone, and thus produce the excess of heat manifested in volcanic activity. While none of these suggestions is entirely satisfactory, and no one of them appears competent to explain all volcanic occurrences, it is nevertheless possible that there are true causes among them, and that collectively they are sufficient.

See the articles GEOLOGY, GEYSER, LACCOLITE, LAVA, PHYSIOGRAPHY, ETNA, KRAKATOA, VESUVIUS, and TAYLOR, MOUNT. Consult J. D. Dana, *Characteristics of Volcanoes* (1890); Charles Darwin, *Volcanic Islands* (in *Voyage of the Beagle*, 1839); C. Daubeny, *Active and Extinct Volcanoes* (1826); C. E. Dutton, *Geology of the High Plateaus* (1880); *Hawaiian Volcanoes*, Ann. Rept. U. S. Geol. Survey (1884); W. L. Green, *Vestiges of a Molten Globe* (1874); J. W. Judd, *Volcanoes* (1881); F. Junghuhn, *Java* (1854); J. L. Lobley, *Mount Vesuvius* (1889); Charles Lyell, *Principles of Geology*; Robert Mallet, *Volcanic Energy* (*Philosophical Transactions* of the Royal Society, London, 1873); G. P. Scrope, *Volcanoes* (1872). G. K. GILBERT.

Vole [Fr.]: the name given in England to rodents of the genus *Arvicola*, which is the type of the sub-family *Arvicolinæ*, belonging to the family *Muridæ*. The related species found in the U. S. are generally known under the name of field-mice, but are thus confounded with species of the sub-family *Murinæ*. See MURIDÆ.

Volga: the largest river of Europe. It rises in the marshes of the western Valdai plateau (government of Tver), Russia, not more than 550 feet above sea-level, and after a winding and tortuous course of 2,325 miles, it enters the Caspian Sea near Astrakhan by some 200 mouths and rivulets. Its basin covers about 563,300 sq. miles, with a population of over 40,000,000. Among the hundred or more navigable tributaries of the Volga the most important are the Oka (longer than the Rhine), draining 97,800 sq. miles, and the Sura from the right, and the Tvertsa, Mologa, and Kama (with a course of 1,120 miles) from the left. The Volga is joined to the Neva by a system of canals, and thus connects the Caspian with the Baltic, and Astrakhan with St. Petersburg. By less important canals the Volga is connected with the Dwina and the White Sea, i. e. Riga and Archangel, while a perfect railway system completes the body of arteries. Among the cities built on or near its banks or within the Volga basin, are Tver, Yaroslav, Kostroma, Moscow, Nijnii-Novgorod, Saratoff, Simbirsk, Kazan, Astrakhan; all of which owe their wealth and importance to the Volga or its tributaries. The period during which the river is closed by ice lasts from 90 to 160 days, according to climatic conditions. The chief Volga traffic is up-river, the amount of merchandise reaching St. Petersburg by way of the canals being about fifteen times more than that reaching Astrakhan. Half a million tons of fish (especially immense quantities of salmon and sturgeon), salt, and naphtha are sent from Astrakhan, besides enormous amounts of grain, flax, and other produce, 465,000 tons reaching Riga. The traffic down the river consists chiefly of wood and timber to supply the southern provinces and the lower Don, which have been almost entirely deprived of their wealth of forests by destructive mismanagement. The trade down-river in manufactured goods is important, and is mostly distributed at Nijnii-Novgorod. HERMANN SCHOENFELD.

Volhyn'ia: a government of Western Russia; bounded S. W. by Galicia, W. by Poland, separated from the latter by the Bug; area, 27,743 sq. miles. In the N. and E. the land is low, level, and sandy, and there are extensive marshes and forests; the south and west are broken by spurs of the

Carpathian Mountains. Agriculture flourishes in the south; grain, timber, cattle, tallow, hides, tar, and potash are largely exported to Odessa, Galicia, Poland, and Prussia (by way of the Bug). Volhynia possesses the finest studs in the empire—those of the Princes Sangusko and the Czartoryskis. Mills and manufactures are increasing yearly. Pop. (1897) 2,999,346, Russians, Poles, Lithuanians, Jews, Germans, and Tartars. Capital, Zhitomir. H. S.

Volition: See WILL.

Volkelt, fōl'kelt, JOHANNES, Ph. D.: professor of philosophy and pedagogy; b. at Liprik, Galicia (Austria), July 21, 1848; studied at the Teschen Gymnasium, Silesia, and at the Universities of Vienna, Jena, and Leipzig; privat docent at Jena, 1876–79; extraordinary professor, Jena, 1879–83; Professor of Philosophy, Basel, 1883–89, Würzburg, 1889–94; Professor of Philosophy and Pedagogy, Leipzig, since Easter, 1894. Volkelt is an energetic critic of positivism in philosophy, and has won especial favor in Germany by his contributions to the theory of cognition and to æsthetics. As the successor to Masius in Leipzig, his lectures on theoretical pedagogy mark him a leader of liberal educational thought. His principal works are *Das Unbewusste und der Pessimismus* (Berlin, 1873); *Der Symbol-Begriff in der neuesten Aesthetik* (Jena, 1876); *Immanuel Kants Erkenntnistheorie nach ihren Grundprincipien analysirt* (Leipzig, 1879); *Erfahrung und Denken: Kritische Grundlegung der Erkenntnistheorie* (Hamburg and Leipzig, 1886); *Franz Grillparzer als Dichter des Tragischen* (Nördlingen, 1888); *Vorträge zur Einführung in die Philosophie der Gegenwart* (Munich, 1892). J. E. RUSSELL.

Volkmann, fōlk'mǎän, RICHARD, von, M. D.: surgeon and author; b. in Leipzig, Germany, Aug. 17, 1830; son of Alfred Wilhelm Volkmann, the physiologist (1801–77). He studied in the Universities of Halle, Giessen, and Berlin; became assistant in Blasius's surgical clinic; was privat docent of surgery at Halle 1857–67; in the latter year became Professor of Surgery and chief of the surgical hospital; was connected with the German army during the wars of 1866 and of 1870–71, in the latter being surgeon-general of the Fourth Army-corps. In 1882 he was offered the professorship of surgery in the University of Berlin, but he declined to leave Halle. He was one of the first to introduce Lister's methods of surgery into Germany. His investigations in surgery and surgical pathology are of importance, and as a lecturer he was unsurpassed. While serving as army surgeon he wrote a work, under the pseudonym of Richard Leander, entitled *Träumereien an französischen Kaminen, Märchen*; it was originally intended for his children, but has passed through fourteen editions. His other works in general literature are *Aus der Burschenzeit* (Halle, 1876); *Gedichte* (Halle, 1877). Among his professional works are *Beiträge zur Chirurgie* (Leipzig, 1875); *Bemerkungen über einige vom Krebs zu trennende Geschwülste* (Halle, 1858); and numerous contributions to medical journals. D. at Jena, Nov. 28, 1889. S. T. ARMSTRONG.

Volkmann, WILHELM FRIDOLIN, Ritter von Volkmar: psychologist; b. in Prague, Bohemia, Sept. 25, 1821; was educated at the University of Prague, where he became docent in 1849, and later professor. He remained teaching philosophy until his death, on Jan. 13, 1877. His principal works are *Die Lehre von den Elementen der Psychologie als Wissenschaft* (Prague, 1850); *Grundriss der Psychologie auf Grundlage des philosophischen Realismus* (Halle, 1856); *Lehrbuch der Psychologie vom Standpunkte des Realismus und nach genetischer Methode* (4th ed. 2 vols., Cöthen, 1894–95); *Die Grundzüge der Aristotelischen Psychologie, aus den Quellen dargestellt und kritisch beleuchtet* (Prague, 1858). J. M. B.

Vollon, vō'lōn', ANTOINE: still-life, figure, and landscape painter; b. in Lyons, France, Apr. 20, 1833; studied in the Academy at Lyons, went to Paris, and first exhibited at the Salon in 1864; received medals at the Salons of 1865, 1868, and 1869, and a first-class medal at the Paris Exposition of 1878; became officer of the Legion of Honor in 1878. He is one of the greatest modern masters of still-life painting, and a wonderful technician. His works are especially notable for strength and depth of color. His *Fisherwoman of le Pollet, Dieppe* (1876); *Curiosities* (1868); *Sea Fish* (1870); and *Armor* (1875) are in the Luxembourg Gallery, Paris. One of his most famous still-life pictures, *The Pumpkin*, was bought by William Schaus, New York, and is in a private collection in New York. WILLIAM A. COFFIN.

Volney, vōl'nā', CONSTANTIN FRANÇOIS CHASSEBŒUF, Comte de: traveler and author; b. at Craon, department of Mayenne, France, Feb. 3, 1757; studied medicine and Oriental languages in Paris; spent several years in Egypt and Syria, and published after his return to France *Voyage en Égypte et en Syrie* (2 vols., 1787; translated into English in the same year), which gave him a great reputation. Elected a deputy for Anjou to the States-General of 1789, he advocated the ideas of the Revolution; published in 1791 *Les Ruines, ou Méditations sur les Révolutions des Empires* (translated into English, New York, 1796; London, 1827), for which he has chiefly his fame as an infidel writer, and *La Loi naturelle, ou Catechisme du Citoyen français* (1793), but was nevertheless imprisoned as a royalist, and saved only by the fall of Robespierre. In 1794 he was appointed Professor of History at the Normal School; traveled in the U. S. from 1795 to 1798; was made a senator in 1799, and published in 1803 *Tableau du Climat et du Sol des États-Unis d'Amérique* (2 vols.; translated into English by C. B. Brown, Philadelphia, 1804). After the establishment of the empire, he retired from the senate, but Napoleon nevertheless made him a count in 1808, and Louis XVIII. a peer in 1814. In 1814–15 he published *Recherches nouvelles sur l'Histoire ancienne* (3 vols.; translated into English by Col. Corbet, London, 1819). His complete works appeared in 8 vols. (Paris, 1820–26). D. in Paris, Apr. 25, 1820.
Revised by A. G. CANFIELD.

Volog'da: northeastern government of Great Russia; bounded N. W. by Archangel, and stretching to the Urals; area, 155,498 sq. miles (one-fourth larger than that of Great Britain and Ireland). The eastern districts are covered with branches of the Ural Mountains, rising to an elevation of from 3,000 to 4,000 feet; but the greater part of the surface is an undulating, marshy plain, dotted with lakes and impenetrable forests of fir and pine, and having a very severe climate. The soil is mostly barren, except in the south, where grain is produced. The sparse population of these regions is of Finnish descent, and is occupied chiefly in hunting and fishing. The people are for the most part still nomadic in their habits, and have their homes in settlements along the rivers, among which are the Northern Dwina, the Suchona, and Petchora with its tributaries. Fur, timber, salt, iron, skins, tallow, and cheese are exported. Pop. (1897) 1,365,313. HERMANN SCHOENFELD.

Vologda: capital of the government of Vologda; on both banks of the river Vologda; 260 miles by rail N. E. of Moscow. It exports to St. Petersburg and Archangel its soap, potash, candles, leather, cordage, and ropes, as well as timber, tallow, and fur, to a considerable amount. Pop. (1888) 17,743. H. S.

Volsci: an ancient people occupying the southern and eastern portions of Latium. They were the hereditary enemies of the Latini and of the Romans, and allies of the Æqui. The Volsci for many generations harassed Rome in a series of bloody wars, but about 338 B. C. they were finally subdued, and became *Latini* (in a legal sense), and later full citizens of Rome. Revised by G. L. HENDRICKSON.

Volscian Language: See ITALIC LANGUAGES.

Volsinii: See BOLSENA.

Volsk: district town in the government of Saratoff, Russia; on the right bank of the lower Volga (see map of Russia, ref. 8–F). It carries on a lively trade on the Volga, especially with Nijnii-Novgorod, and is surrounded with gardens and orchards, the produce of which forms the chief wealth of the town and the flourishing neighborhood. Pop. (1890) 39,995. H. S.

Volt [named from the Italian physicist ALESSANDRO VOLTA, *q. v.*]: in electricity, the practical unit of electromotive force or potential difference. With the growth of knowledge of the precise values of the absolute or C. G. S. units, upon which the system of practical electrical units is based, slight modifications in the definition of the volt have become necessary. The last authentic definition, that of the chamber of delegates of the Chicago congress of electricians (1893), is as follows:

The chamber recommends "as a unit of electromotive force the international volt, which is the electromotive force that, steadily applied to a conductor whose resistance is one international ohm, will produce a current of one international ampere." In this definition, as in all previous definitions of the volt, reference is made to the ampere and the ohm. The international ampere, as defined by the Chicago

congress, is "one-tenth of the unit of current of the C. G. S. system of electromagnetic units." It is represented sufficiently well for practical purposes by the unvarying current which, when passed through a solution of nitrate of silver in water, deposits silver at the rate of 0·001118 gramme to the second. The international ohm, as fixed by the same congress, is the closest approximation which was attainable at that time to 10^9 C. G. S. units of resistance. It is "represented by the resistance offered to an unvarying electric current by a column of mercury, at the temperature of melting ice, 14·4521 grammes in mass, of a constant cross-sectional area and of the length of 106·3 cm." The ampere and ohm being thus definitely established, the volt is also established.

The volt may also be defined approximately, as was done by the Chicago congress, as "$\frac{1000}{1434}$ of the electromotive force between the poles or electrodes of the voltaic cell known as Clark's cell, at a temperature of 15° C.," and prepared in a specified manner. E. L. NICHOLS.

Vol'ta, ALESSANDRO: physicist; b. at Como, Italy, Feb. 18, 1745; was first Professor of Physics at Como and then in the University of Pavia, where he taught and studied for thirty years. In 1769 he published a dissertation, *De Vi attractivâ Ignis Electrici*; in 1775 invented the perpetual electrophore, in 1777 a lamp for inflammable gas, in 1782 the electric condenser, and finally arrived at the invention of the famous pile which bears his name, and was described by him in a letter to Sir Joseph Banks in the year 1800. Summoned to Paris by Napoleon I., he received the gold medal of the Institute, of which he became a member in 1802. Napoleon conferred upon him the title of count and a senatorship. The works of Volta were published at Florence in 5 vols. in 1816. D. at Como, Mar. 5, 1827.

Voltaic Battery and Voltaic Electricity: See ELECTRICITY and BATTERY, VOLTAIC.

Voltaire, vol-tãr', FRANÇOIS MARIE AROUET, de, universally known by the name he assumed, Voltaire: poet, dramatist, historian, and philosopher; b. in Paris, Nov. 21, 1694, of parents of the middle class in comfortable circumstances. His education was received at the Jesuit college Louis-le-Grand; at the age of sixteen he left the college and at his father's wish began the study of law, though he had no taste for it. At the college he had allied himself with the sons of families of nobility, wealth, and distinction, and his great ambition was to shine in polite circles and enjoy to the full the gay life of the free-livers of the Temple. His wit and facility in turning verses made him a favorite in the houses of great lords like Sully and Villars, but also brought him into trouble with the authorities. Some scandalous lines on the regent led to his banishment from Paris to Sully-sur-Loire in May, 1716, and just a year later, for a satire that really was not his, he was sent to the Bastile. During his confinement of eleven months, wholly without rigor, he laid the solid foundations of his poetic fame, finishing the tragedy *Œdipe*, and beginning the heroic poem on Henry IV., the *Henriade*. In these works, but more especially in the occasional poems, epistles, epigrams, etc., that streamed from his pen, he showed himself the skeptical and railing critic of the religious and political traditions of his country, and provoked the enmity of the Church and that suspicious hostility of the censorship which never ceased to follow his works and denied most of them the privilege of open publication in France. The relations that he cultivated with the nobility exposed him to a rude insult from the Chevalier de Rohan, who had him beaten and then thrown into the Bastile when he showed himself revengeful. He was set free only on condition that he retire to England (1726). The three years spent there and the acquaintance they gave him with English literature, institutions, philosophy, and life were of the utmost importance for the development of his ideas and his criticism. Upon his return to France (1729) suspicion was still too alert against him to make his stay in Paris safe. After three years of almost continual movement, but great productivity, he settled down to a quiet and industrious life at Cirey with Mme. du Châtelet, where he remained till her death in 1749. In these years he was particularly interested in the study of the natural sciences, and his ambition was becoming more serious. He had already established relations by correspondence with Frederick II. of Prussia, and in 1750 accepted his invitation to live at his court. But rivalries and jealousies, his own duplicity and petulance, and the king's steady mastery, filled his stay in Berlin with irritations and quarrels. He fled in anger in 1753, launching satires against his enemies, among whom he now counted the king. After some years of wandering he purchased an estate at Ferney, near Geneva, where the rest of his life centered. In these years Ferney became the resort of literary men from all parts of Europe, and the "patriarch of Ferney" was the foremost man of letters of the world. D. May 30, 1778, in Paris, where his reappearance three months before had provoked unbounded enthusiasm. An outward and formal submission to the requirements of the Church secured him absolution and Christian burial. The Revolution gave him the honor of public burial in the Pantheon. His mind was prodigiously active and supple and his industry tireless, and he achieved the highest distinction of his time in almost all forms of literature: in elevated poetry by the *Henriade* (1728); in light and satiric verse by a vast number of pieces; in tragedy by works such as *Œdipe* (1718), *Zaïre* (1732), *Alzire* (1736), *Mahomet* (1741), *Mérope* (1743), *Sémiramis* (1748), etc.; in history by the *Histoire de Charles XII.* (1731), *Siècle de Louis XIV.* (1751), and others; in fiction by *Zadig* (1748), *Candide* (1759), *La Princesse de Babylone* (1768), etc.; in the political or philosophical essay or pamphlet by the *Essais sur les Anglais* (1831), *Discours sur l'homme* (1734–37), *Essai sur les mœurs et l'esprit des nations* (1756), *Dictionnaire philosophique* (1764); his contributions to the great *Encyclopédie* of Diderot, etc. His mind was not profound, but it was perfectly lucid and saw what it saw with perfect distinctness. He was not an original thinker, but appropriated ideas eagerly and swiftly, and by his remarkable power of clear and forcible expression he made them seem simple and easy. He turned the large coin of philosophy and criticism into small change of universal circulation. The alertness of his wit, the searching keenness of his satire, his exhaustless resources of ridicule and persiflage, powerfully seconded his appeal to reason against superstition and the oppression of traditional authority. Essentially a conservative in politics, an aristocrat by instincts and tastes, he yet contributed immensely to the revolutionary movement and the democratic idea by undermining the historic institutions by criticism from the standpoint of even and universal justice. He loved justice and did its cause direct practical service by his defense of Jean Calas. He was essentially epicurean in his view of life, and rebelled at the asceticism lurking in the Christian distrust of the body and its satisfactions; he was devoted to the luxurious accompaniments of civilization. So he was hostile to Protestantism and Jansenism for their moral severity, as to Catholicism for its intellectual tyranny and abuse of power. He was utterly without reverence, as was revealed in his scandalous travesty of the figure of Joan of Arc, *La Pucelle d'Orléans* (1730–39), as well as in his well-known enmity to religion. He held the theological conceptions of deism, but he was profoundly irreligious, and though he was thinking chiefly of the Church as an institution in his famous denunciation, *Écrasez l'infâme*, his attack involved the whole fabric of historical Christianity and even most exhibitions of the religious sentiment. The pert and superficially informed ridicule of religion current in certain classes in France is derived in great measure from him. In his personal relations he was capable of devotion and generosity, but was habitually suspicious and jealous, often deceitful and spiteful, and sometimes grossly untruthful, and apparently utterly selfish. By the universality and lucidity of his mind and, in spite of its superficiality, by the unfailing flash of his wit, by his prodigious literary cleverness, he deserves his rank as first man of letters of his time and one of the most powerful contributors to the work of enlightenment and intellectual enfranchisement which was the task of the eighteenth century.

LITERATURE.—All older editions of his works are superseded by the editions of Beuchot (Paris, 1828, *et seq.*, 70 vols. and 2 vols. index); Avenel (Paris, 1867, *et seq.*, 8 vols. 4to); and L. Moland (Paris, 1877–83, 50 vols. and 2 vols. index). There is an English translation by Smollett and others (London, 1776, 37 vols.). Many single works have been frequently reprinted separately. See Longchamp and Wagnière (his secretaries), *Mémoires sur Voltaire et sur ses ouvrages* (2 vols., Paris, 1825); Villemain, *Tableau de la littérature du dix-huitième siècle*; G. Desnoiresterres, *Voltaire et la société française au XVIIIe siècle* (8 vols., Paris, 1867–76); Bengesco, *Voltaire, Bibliographie de ses œuvres* (4 vols., Paris, 1882–90); J. Morley, *Voltaire* (London, 1871); D. F. Strauss, *Voltaire* (Leipzig, 1870); James Parton, *Life of Voltaire* (2 vols., Boston, 1881); E. Champion, *Voltaire* (Paris, 1892); see also Carlyle's essay on *Voltaire* and Macaulay's essay on *Frederick the Great*. A. G. CANFIELD.

Voltam'eter [from *voltaic* (see VOLT) + Gr. μέτρον, measure]: an instrument for the measurement of the electric current by means of its electrolytic action. The principal forms are the water voltameter, the silver voltameter, the copper voltameter, and the zinc voltameter.

The water voltameter is usually given a construction similar to that shown in Fig. 1. The current is carried into the voltameter by means of the wire marked +, which is connected with a platinum electrode within the mouth of the inverted cylindrical tube O, which is nearly filled with water. The other electrode, which is connected with a wire marked —, through which the current leaves the voltameter, is similarly situated at the bottom of the inverted tube H. The passage of the current in the direction indicated decomposes the water in the two tubes, setting free oxygen in O, upon the surface of the + electrode and hydrogen in H at the surface of the — electrode. The measurement of the volumes of the gases liberated in a given time affords a measure of the average value of the current.

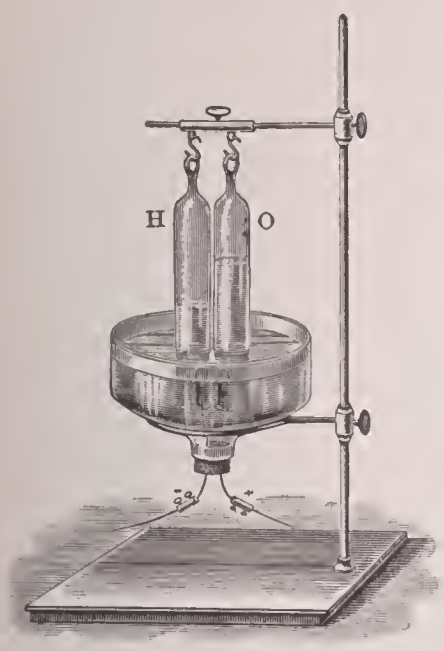

FIG. 1.

The water voltameter is subject to errors due to loss of gas by occlusion upon the surfaces of the electrodes and by absorption within the liquid of the voltameter. When these sources of error are avoided, and the amount of gas developed is determined by the exact methods of chemical gas analysis, the water voltameter becomes an instrument of precision. On account of the laborious character of the operations when thus carried out, however, it has been almost altogether abandoned in favor of more convenient forms.

The silver voltameter is perhaps the most exact of all known types. In its best-known form (Fig. 2) it consists of a platinum dish containing an aqueous solution of silver nitrate ($AgNO_3$). Below the surface of the solution is placed the losing electrode, which consists of a sheet or coil of wire of pure silver. To catch the granules of metal which are detached during electrolysis the terminal is wrapped in filter paper or other porous material. The platinum dish serves as a gaining electrode, and upon its inner surface the silver is deposited in shining crystals. The amount deposited in a given time is determined by weighing the platinum dish before and after the operation. The silver voltameter owes its accuracy to the insolubility of the deposit in the electrolyte, and to the fact that the former may be washed, dried, and weighed without loss, and also without gain by oxidation.

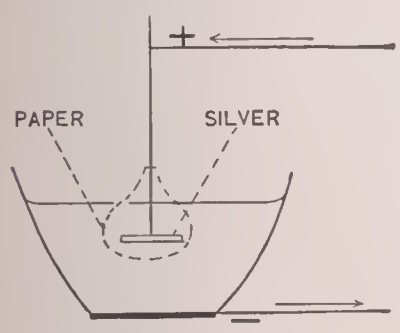

FIG. 2.

An ampere of current deposits silver at the rate of 0·001118 of a gramme per second. To get the best results, a silver voltameter for a circuit carrying 1 ampere, according to the specifications of the chamber of delegates of the Chicago congress of electricians, should have:

(1) As kathode, a platinum bowl not less than 10 cm. in diameter and from 4 to 5 cm. in depth.

(2) As anode, a plate of pure silver not less than 30 sq. cm. in area and 2 to 3 mm. in thickness.

(3) As electrolyte, a neutral solution of pure silver nitrate containing about 15 per cent. by weight of the nitrate and 85 parts of water.

The copper voltameter is inferior to the silver voltameter in that the deposit is not altogether insoluble in the electrolyte, nor so free from oxidation within and without the solution. It possesses certain advantages, however, the chief of which are the cheapness of the apparatus and of the electrolyte, the non-corrosive character of the latter, and the firmly adherent quality of the deposit. With proper manipulation it is scarcely below the silver voltameter in accuracy, but as commonly used the errors sometimes amount to ·01 or more. Two forms of the copper voltameter are shown in Figs. 3 and 4. The former consists simply of two copper plates submerged in a cell containing a solution of copper sulphate in water. A current sent through the voltameter from *a* to *k* carries copper with it at a rate which varies very slightly from ·000328 gramme per ampere per second, according to the density of the current and the temperature of the solution.

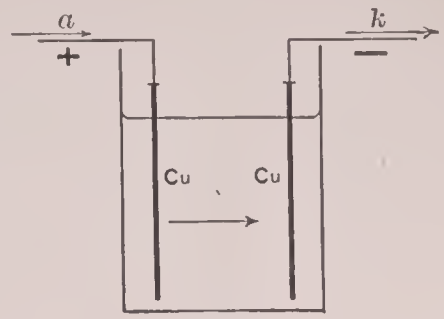

FIG. 3.

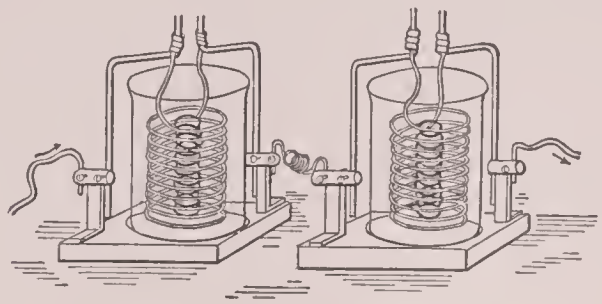
FIG. 4.

With high values of the current density, the deposit upon the edges and corners of the gaining electrode becomes granular and non-adherent, and the indications of the voltameter begin to lose their accuracy. This source of error is avoided in the form of apparatus shown in Fig. 4. This instrument, which is due to Ryan, is known as the spiral-coil voltameter. The electrodes are coils of copper wire with a common vertical axis. Reasonable care in the handling of such an instrument affords uniformly consistent results, with errors not greater than ·001 to ·002.

The zinc voltameter is used solely in the measurement of the electric current for industrial purposes. It is one of the best-known types of electric meters (see WATT-METER), and is technically known as the chemical meter. For the purpose in question it has been found better adapted than other forms of voltameter, although inferior to them where a high degree of precision is required. See ELECTRICITY, ELECTROLYSIS, etc. E. L. NICHOLS.

Volter'ra: a town in the province of Pisa, in Northern Italy; on the summit of a steep hill at the height of 1,800 feet above the sea, about 50 miles S. W. from Florence (see map of Italy, ref. 4–D). Volterra was the largest of the twelve capital cities of Central Etruria, and sustained a long struggle against Rome, but the time of its final conquest is not known. During the Middle Ages Volterra was alternately the spoil of popes and emperors. In the latter part of the fourteenth century it fell into the hands of the Florentine republic, and remained ever after a possession of Tuscany. Volterra still retains some of her ancient gates, and considerable fragments of the old Etruscan wall, built of huge blocks of stone without cement, and much more extensive than the mediæval fortifications. The population is thought to be of more unmixed Etruscan blood than that of other old towns of that people, and many of the names read on the ancient sepulchral monuments are those of families still existing in the city and territory of Volterra. The cemeteries have yielded rich contributions to Etruscan archæology, and the city museum—which, among many other interesting antiques, contains not less than 400 cinerary urns and sarcophagi, chiefly of alabaster enriched with sculptures—is among the most important existing repositories of Etruscan art. In the neighborhood of Volterra are valuable salt springs, called by an Arabic name, *le moje*, yielding annually about 7,000 tons of salt. The Volterran quarries of alabaster are among the finest known deposits of that stone, and articles manufactured from it find a market all over the world. The cathedral, enlarged by Andrea Pisano in 1254, is a fine structure, and contains good pictures. Pop., comprising the suburbs and some separate hamlets, 14,060. Revised by M. W. HARRINGTON.

Volterra, Daniele, da, properly Daniele Ricciarelli: painter and sculptor; b. at Volterra, in Tuscany, in 1509; went to Rome when very young. Under the influence of Michelangelo and greatly befriended by him Daniele painted many large pictures. An *Assumption of the Virgin*, forming the altarpiece in the Church of SS. Trinità de' Monti, is especially famous, and in a chapel of the same church is a *Taking down from the Cross*, which is greatly injured, perhaps from having been transferred from the wall to canvas, but which was at one time called by critics who were admirers of a certain classical convention one of the three greatest pictures in the world, the others being Raphael's *Transfiguration* in the Vatican picture gallery and Michelangelo's *Last Judgment* in the Sistine Chapel. At a later time Daniele was employed to paint draperies about some of the nude figures in the last-named fresco, and from this he was called *Il Braghettone*, "the breeches-maker." On the death of Henry II. of France in 1559, his widow, Catharine de' Medici, tried to get an equestrian statue of the dead king from Michelangelo. The work was transferred to Daniele, who finished the horse and had it cast in bronze before his death. This horse stood for many years in the Place Royale in Paris and has disappeared, said to have been destroyed in the Revolution. Daniele died in Rome, Apr. 4, 1566. Pictures formerly ascribed to Michelangelo are now often attributed to Daniele. In the Uffizi at Florence there is a *Massacre of the Innocents*. In the store-rooms of the Louvre there is a *David and Goliath*, two renderings of the subject on the two sides of a slab of slate, a picture long called a Michelangelo. In the Farnese Palace in Rome there is a fine *Triumph of Bacchus*. Russell Sturgis.

Vol'tri (Mediæv. Lat. *Ulte'rium*): town; province of Genoa, Italy; on the seashore between the Leira and the Cerusa; about 9 miles W. of the city of Genoa, with which, however, it is connected by an almost continuous line of houses (see map of Italy, ref. 3–D). Voltri has flourishing manufactures, contains some fine churches, and near it are charming villas, the most striking of which is the Brignole-Sale, on a hill commanding an exquisite view of this lovely coast. Voltri contains many paper-factories, and the sulphurous water employed in its manufacture is believed to protect the paper against the attacks of the book-worm, for which reason it is used by regulation in many of the public offices in England. It is also exported to the U. S. The mechanical power of the two torrents is also further utilized in the manufacture of cotton, wool, hemp, linen, leather, etc. The mineral springs near Voltri, known as Acqua Santa and Acqua della Penna, are much frequented. Pop. 6,360. Revised by M. W. Harrington.

Voltur'no (anc. *Vulturnus*): the principal river of Southern Italy. It rises in Monte Santa Croce, near Castellone, flows first S. E., then W., through the plains of Campania, and enters the Gulf of Gaëta after a course of 100 miles. Along the Volturno was fought a series of battles between Garibaldi and the royal Neapolitan troops Sept. 19 and 21, and Oct. 1 and 2, 1866, in which the former was victorious.

Volume, Molecular or **Specific**: a value obtained by dividing the specific gravity of a substance in the form of liquid into its molecular weight. The study of specific volumes has led to the conclusion that a close connection exists between the values and the constitution of the substances.

Volumetric Analysis: See Analysis, Volumetric.

Voluntary [from Lat. *volunta'rius*, willing, deriv. of *volens* (*vo'luns*), pres. partic. of *vel'le*, will; so called from being at first extempore]: in music, a term originally signifying an extempore performance on the organ, usually before the opening or at the close of divine worship. In the pure voluntary the performer was unrestricted by any set form, rule, or style, but gave free scope to his imagination and to his skill in execution. In the present day the term "voluntary" is also applied to compositions of this class which are not extempore, but premeditated and carefully written. Large collections of them, composed by the best masters, have been published, and are extensively used under the names of organ-pieces, preludes, offertories, postludes, etc.

Voluntary Conveyance: in law, a deed of conveyance without the adequate consideration which the law deems valuable—that is, something upon which a pecuniary estimate can be placed. It is, therefore, a gift and is frequently made to some near relative of the grantor, in which case the consideration is love and affection, which is regarded as "good," though not as "valuable." As such, it is entirely legal and valid as between the parties—except, of course, where obtained by fraud or undue influence—for the law permits gifts to be freely made so long as the creditors of the donor are not thereby defeated or delayed. The term voluntary conveyance is generally applied to such a deed of lands, but the same principles control all similar transfers of chattels and other forms of personal property. The peculiar legal interest connected with voluntary conveyances arises from their effect upon the rights of the creditors of the grantor or transferror, and all the modern law on that subject has practically originated from two statutes passed in the reign of Elizabeth and from subsequent legislation of the same import. These statutes and the rules of law derived therefrom are treated in the article on Fraudulent Conveyance. Revised by Francis M. Burdick.

Voluntaryism: the theory and practice of the support and control of churches by the voluntary act of their adherents as opposed to support and control by the state. The theory is based on considerations drawn from Scripture, from history, and from social equity. Even under the theocratic system of the Old Testament religion presents certain voluntary aspects. And, turning to the New Testament, the whole movement of Christianity at the beginning was of the voluntary kind. It had no state support and no state control. Christ's kingdom was declared by himself to be "not of this world," and therefore its being linked to the secular government of a country, to be enriched and guided thereby, is entirely out of the question. Further, it is a fact of history that Christianity was more truly (i. e. more spiritually) prosperous before it was endowed by the state than afterward; that Constantine's was a fatal gift; that the union between the Church and the empire gave power to persecution; that now orthodoxy and then heterodoxy became established, and that each in turn oppressed the other through the enforcement of political laws; that during the Middle Ages the Church became miserably corrupted by its secular relations, and that some of the brightest spiritual lights of that long period are to be found among those who protested against the worldliness of the reigning religion, and promoted spiritual truth and life in voluntary ways. The establishments in Europe have been instruments of persecution, and in them the wealth of the Church, being in worldly hands, has been necessarily misapplied. A comprehensive church supported by the state so as to be truly national is an impossibility, and therefore every establishment is and must be more or less sectarian. It is the church of a party, not of a united people, and hence the unendowed and unpatronized are placed on terms of inequality, and consequently suffer a social wrong. Men ought not to be taxed for the support of creeds and systems in which they do not believe, and all such taxation involves social injustice.

The voluntary principle was implied, if not distinctly asserted, in some of Wycliffe's writings; still more clearly by Leonard Busher, a London citizen and Baptist, in a tract published in 1614; but most of all, in his own day, by Roger Williams in his *Bloody Tenet of Persecution* (1644). Not that the voluntary support of religion was prominently maintained in these works, but phases of religious liberty were unfolded which lead to such a conclusion. The Quakers, too, were among the pioneers of voluntaryism. On the other hand, the Puritans and Presbyterians generally advocated a state church; and some of the Independents and some of the Baptists accepted livings and emoluments in the Establishment. The Pilgrim Fathers and the founders of Massachusetts did not avoid state complications. Such Nonconformists as Watts and Doddridge based their nonconformity on other grounds than that of opposition to a legal establishment of religion. The clear enunciation of the principle in England began in the first quarter of the nineteenth century, and has ever since been gaining ground.

Nowhere is the practice of voluntaryism exemplified as it is in the U. S. Ever since the war of Independence closed and the U. S. became separated from Great Britain, religion has been left for its support to the willing offerings of Christian people. The establishments which once existed have disappeared. Magnificent churches, well-supported ministers, prosperous colleges, and religious societies of all descriptions attest the energy and power of voluntaryism.

The voluntary system has been at work in Great Britain by the side of the Establishment ever since nonconformity began. The practice preceded the theory. Before any

definite ideas on the subject obtained, proscribed sects were of necessity thrown upon their internal resources. Tithes and church-rates were beyond their reach had they wished for them. It is remarkable that those who practice the voluntary system, in a small minority 200 years ago, have so multiplied and increased as now to vie with the endowed Church in activity and influence. In England the Congregational, Methodist, Baptist, Presbyterian, and Roman Catholic Churches and other large bodies are all voluntary communities. The voluntary system in Scotland has been widely extended since the Disruption of 1843. The Free Church, which exists all over Scotland, as well as the United Presbyterian and other established religious bodies, is entirely dependent for support on contributions from members and friends. Revised by W. J. BEECHER.

Volunteers: See MILITIA.

Volunteers of America: See the Appendix.

Volusenus, FLORENTIUS: See WILSON, FLORENCE.

Volu'tidæ [Mod. Lat., named from *Volu'ta*, the typical genus, from Lat. *volu'ta*, spiral scroll]: a family of gasteropod molluscs containing some of the most beautiful and esteemed of univalve shells. The animals have the normal gasteropod form; the mantle is often more than usually well developed; the siphonal extension is short and recurved (generally provided with auricle-like appendages at the base); the head is large and proboscidiform; the tentacles mostly far apart and connected by a broad "veil" forming a hood over the head, sometimes (in *Volutomitra*) close together; the eyes sessile on the head, near the outer bases of the tentacles; teeth of the lingual ribbon are in a single longitudinal row, but diversiform in the several groups; the foot broad in front; an operculum is sometimes developed, but usually wanting; the shell is convolute or turreted, with a narrow aperture and an anterior notch, with the columella obliquely plaited anteriorly. Although the generally recognized constituents of the family seem at first to be naturally associated in a group of the rank in question, on account of the similarity of the shell, they differ so decidedly in dentition as to render it doubtful whether the association is of the value assigned. The representatives of the family are mostly confined to the tropical seas, and there they attain the largest size and exhibit the most beautiful colors. A few, however, are found in the temperate and even cold seas; the most northern species is a small shell, the type of the genus *Volutomitra*, the *V. grœnlandica* of authors. In time they have ranged from the Cretaceous period to the present, and in the Miocene epoch typical forms of the family extended much farther north in both hemispheres than at present. The species are carnivorous. The principal genera are *Yetus* (=Cymbium, boat-shells), *Voluta* (much subdivided), *Volutolyria*, *Lyria*, *Enœta*, and *Volutomitra*. Revised by E. A. BIRGE.

Vomer [Mod. Lat., from Lat. *vo'mer*, plowshare]: in the mammalia one of the bones of the skull forming the septum of the skeleton of the nose. In reality it is a double bone arising as two separate elements, right and left, from the roof of the mouth. In the lower vertebrates these bones occupy that position permanently and frequently bear teeth. In transcendental anatomy it is considered the centrum of the first cephalic vertebra. It affords important characters in the classification of many fishes.

Vomiting [from Lat. *vo'mere*, *vo'mitum*, vomit: Gr. ἐμεῖν (whence Eng. *emetic*): Sanskr. *vam-*]: a reflex contraction of the muscular coats of the stomach, ejecting its contents. It is an involuntary and spasmodic act, but when established may be aided by voluntary effort. The contraction of the stomach and vomiting may be the result of disease of the brain, of the pneumogastric nerve, of the walls of the stomach, of catarrh or inflammation of its mucous lining; it may be the result of indigestible food, bile, or mucus in the cavity of the stomach, or a sympathetic reflex result of disease in other organs, as the uterus, ovaries, or liver. The vomiting of pregnancy and of uterine or ovarian disease, bilious vomiting, vomiting of gastric catarrh, the vomiting at the onset of acute fevers and eruptive diseases of children, and vomiting from surgical causes, as fracture at the base of the skull, or concussion and inflammation of the brain, are to be distinguished, each from the other, in some instances, by peculiar features of the act of vomiting, but more often by observation of the associated symptoms. (See STOMACH.) At the onset of vomiting the face may be deathly pale; the surface becomes cool and bathed with clammy sweat; the pulse small and feeble; and great prostration results. In some instances faintness occurs, or even fatal syncope. An occasional accident during vomiting is the impaction of solid food or artificial teeth in the larynx, causing suffocation. Robust persons, but little depressed by vomiting, become red in the face during the effort, and later are cool and slightly pale. A person vomiting should have his clothes loose, the air in the room should be fresh, and cold water should be poured on the face if needed. Stimulants are sometimes necessary to counteract collapse. Ice, carbonic-acid water, creosote, oxalate of cerium, and dilute hydrocyanic acid are useful remedies to allay vomiting. Revised by W. PEPPER.

Vomiting of Blood: See HÆMATEMESIS.

Von'del, JOOST, van den: Dutch poet and dramatist; b. at Cologne, Nov. 17, 1587; d. in Amsterdam, Feb. 5, 1679. His father, by trade a hatter, had fled to Cologne from Antwerp, on account of his faith. There he had married Sara Kranen, daughter of Peter Kranen, a man of some literary celebrity in his native city. In 1597 the poet's parents removed to Amsterdam and there established a hosiery-shop. This later passed to their son, and was his means of support until 1657, when it was swallowed up in bankruptcy caused by a reckless son of his own. It should be said, however, that the poet's wife was the business manager of the family, leaving him for the most part unmolested in his poetic pursuits. After experiencing bankruptcy, the poet was given a place as bookkeeper in the public loan office, receiving full salary even after his retirement in 1668 on account of old age. Vondel's life was thus in the main that of a quiet middle-class shopkeeper, and this shows itself clearly, and often with intention, in his poetic work. He knew agitations, however, particularly when he determined to give up his Arminian faith and turn Catholic (1640). His earliest work is strongly under the influence of the poetical school known as the *Rederijker*. To this period belong his first drama, *Het Pascha* (1612), and his earliest lyrics. Soon after the production of *Het Pascha*, however, he became intimate with the members of the group of Coster, particularly Hooft and Roemer Visscher. From these men he obtained a much greater knowledge of the classics than his meager education had given him; and he conceived an unbounded admiration for the masterpieces of the Greek and Latin drama, as well as reverence for the dramatic rules laid down by Aristotle in the *Poetics*. In his subsequent dramatic work, accordingly, he strove to conform to these rules, observed the unities, employed a chorus, etc. The result was not unhappy, owing mainly to the fact that his own genius was rather lyric than dramatic in the true sense. He liked also to use his plays for didactic and even controversial purposes. We have from him a double series of pieces, the first consisting of translations or imitations of classic plays; the second, of original dramas. To the first belong the *Amsterdaemsche Hecuba* (1625) and *Hippolytus* (1628), imitated from Seneca; the *Electra* (1638), *Koning Oedipus* (1660), and *Hercules in Trachin* (1663), from Sophocles; the *Ifigenie in Taurien* (1666) and *Feniciaensche Ifigenie* (1668), from Euripides. Of his original dramas the best are *Hierusalem verwoest* (1620); *Palamedes* (1625); *Gijsbrecht van Aemstel* (1637); *Maria Stuart* (1646); *Lucifer* (from which Milton has been thought to have borrowed, 1654); *Jephtha* (1659); *Adam in Ballingschap* (1664); *Zungchin* (1666); *Noah of ondergang der eerste werelt* (1667). Poetically quite as significant as the plays, however, are the lyric poems. Of these many, to be sure, were written to order, and sound hollow and pompous, after the manner of such verse. But in others the real delights and admirations of the man appear with power and beauty, his joy in Holland's greatness on the sea and in trade, his stalwart preference for bourgeois ideals of life, his simple gladness in the presence of nature. His genius here shows itself, flawed indeed by constant lack of taste and often curiously limited, but none the less true genius. And he still remains, on the whole, the greatest poet Holland has had. Vondel's works have been edited, with *Life*, by J. von Lennep (12 vols., Amsterdam, 1855–69; new ed. 1888, *seq.*). See also Baumgartner, *Joost van den Vondel* (Freiburg, 1882); Unger, *Bibliographie van Vondels werken* (Amsterdam, 1888); Looten, *Étude littéraire sur le poète néerlandais Vondel* (Brussels, 1889); D. Haek, *Justus van den Vondel: ein Beitrag zur Geschichte des niederländischen Schriftthums* (Hamburg, 1890); August Müller, *Ueber Miltons Abhängigkeit von Vondel* (1891). A. R. MARSH.

Von der Recke: See RECKE, ERNST, VON DER.

Von Huysum, JOHN: See HUYSUM, JOHN, VON.

Von Martius: See MARTIUS, CARL FRIEDRICH PHILIPP, VON.

Voorhees, DANIEL WOLSEY: U. S. Senator; b. at Liberty, Butler co., O., Sept. 26, 1827; graduated at Indiana Asbury (now De Pauw) University in 1849; was admitted to the bar in 1851; was U. S. district attorney for Indiana 1858–61; defended John E. Cook for participation in the Harper's Ferry raid 1859; was a Democratic member of Congress 1861–65 and 1869–71. He became U. S. Senator from Indiana in 1877, filling the vacancy caused by the death of Oliver P. Morton. One of his earliest speeches in the Senate was a plea for the free coinage of silver and the preservation of the greenbacks as full legal-tender money. He was re-elected to the Senate in 1879 (the rival candidate being Benjamin Harrison), 1885, and 1891. D. April 10, 1897.

Voragine, JACOBUS, de: See JACOBUS DE VORAGINE.

Vorarlberg, fō-raarl'bärch: extreme western province of Austria, between Switzerland and Tyrol; administratively associated with the latter. Chief town, Bregenz. See TYROL.

Vor'men: one of the principal rivers of Norway. It rises under the name of Lougen in the Lessö-Verks-Vand, at an elevation of more than 2,000 feet, flows through the narrow, wild, but beautiful Gudbrandsdale, forms the Lake of Mjösen, receives then the name of Vormen, and joins the Glommen. Lake Mjösen, about 80 miles long and 8 miles broad, and situated at an elevation of between 500 and 600 feet, is the scene of some traffic.

Voronej, or **Voronetz**, vō-rō-nesh': a government in the south of Great Russia; on both sides of the Don; area, 25,443 sq. miles. On the southern slopes of the central Russian plateau its surface is hilly in the west, but flat to the E. of the Don. The soil, rich in black earth, is very fertile, and the climate mild. Voronej is drained by the Don and and its principal tributaries. The former traverses the government from N. to S. W. for more than 400 miles, and is the principal channel for the export of grain, cattle, tallow, wool, fruit, skins, and other raw produce. Wood is imported from the north, less than one-tenth of the area being forested. The chief articles of manufacture are spirits, oil, sugar, woolens, and tallow. Cattle, sheep, and especially horses of excellent breed are largely raised. Pop. (1897) 2,547,320.

Voronej, or **Voronetz**: capital of the government of Voronej; on the river of the same name, near its junction with the Don; 365 miles by rail S. of Moscow (see map of Russia, ref. 8–E). It is the seat of a military school and a gymnasium for boys and girls, and has an important theater. Its trade in grain, flax, tallow, hides, wood, and coal by way of the Don and the Moscow Railway to the Sea of Azov is important. Pop. (1897) 84,015. H. S.

Vö'rösmarty, MIHÁLY: poet; b. at Nyék, Hungary, Dec. 1, 1800; d. Nov. 19, 1855. He studied law at Pesth, but early turned to literature. This did not prevent him, however, from taking an ardent and active part in the struggle of Hungary for freedom. He was an eager revolutionist in 1848, and a member of the short-lived National Assembly. Twice he was condemned to death by Austrian tribunals and twice reprieved at the last moment. The failure of the revolution to obtain permanent success nearly broke his heart; he withdrew to his country estate and long refused even to write. For a brief period before his death, however, he had recovered somewhat his mental tone, and had begun a translation of Shakespeare, which was left at his death incomplete. His literary work was in many kinds and much of it excellent. His epic narrative *Zalán futása* (The Flight of Zalán, 1825) awakened great enthusiasm in Hungary by reason of its patriotic feeling. Of the same character is the shorter epic *Eger* (1827). As a dramatist he won great applause, though rather by the lyric fervor of his pieces than by their dramatic excellence. Perhaps the best of his plays are *King Solomon* (1821) and *Kont* (1825). Many of his minor poems have great beauty, and one among them, the patriotic song *Szózat* (1845), is almost a national hymn among the Hungarians. A complete edition of his *Works*, with *Life*, was edited by Paul Gyulai (10 vols., 1865–66; 2d ed. 12 vols., 1884). A. R. MARSH.

Vor'stius, CONRAD: theologian; b. in Cologne, Germany, July 19, 1569; studied theology at Heidelberg; lectured in Geneva; became Professor of Divinity at the Gymnasium of Steinfurt 1596; in 1599 was acquitted of the charge of Socinianism, and in 1610 succeeded Arminius as Professor of Theology at Leyden. He got into controversy with the Gomarists and was deposed in 1612, and solemnly condemned as a heretic by the Synod of Dort in 1619. He fled from Holland, and lived in concealment until 1622, when the Duke of Holstein offered the Arminians an asylum, but Vorstius died shortly after at Tönningen, Schleswig-Holstein, Sept. 29, 1622. Revised by S. M. JACKSON.

Vos, GEERHARDUS, Ph. D., D. D.: professor of theology; b. at Heerenveen, Netherlands, Mar. 14, 1862; was educated at the Gymnasium of Amsterdam, Seminary of Holland Christian Reformed Church, Grand Rapids, Mich., Princeton Theological Seminary, and the Universities of Berlin and Strassburg; was Professor of Theology in Seminary of Holland Christian Reformed Church 1888–94; since 1894 Professor of Biblical Theology in Princeton Seminary. Dr. Vos has published *The Mosaic Origin of the Pentateuchal Codes* (New York, 1886); *Die Kämpfe und Streitigkeiten zwischen den Banu Umajja und den Banu Haschim von Takijj addin al-Makrizijj* (Arabic dissertation, Leyden, 1888); *The Doctrine of the Covenants in Reformed Theology* (Grand Rapids, 1891); and *The Idea of Biblical Theology as a Science and as Theological Discipline: Inaugural Address* (New York, 1894). C. K. HOYT.

Vos, MARTIN, de: painter: b. in Antwerp in 1530: studied painting in Antwerp under Francis Floris, and in Venice under Tintoretto; formed a school in Antwerp. His best pictures, including *The Triumph of Christ*, *Cæsar's Penny*, and *St. Luke painting the Portrait of the Virgin*, are in the museum in Antwerp. D. in Antwerp in 1603.

Vose, GEORGE LEONARD: See the Appendix.

Vosges, vōzh: department of Eastern France; area, 2,266 sq. miles. The eastern portion of the department is occupied by the Vosges Mountains, which are partly covered with forests of oak, beech, and fir, and partly afford excellent pastures, where large quantities of superior cheese are produced. In the western portion, the Plaine, wheat, wine, and fruits are raised. Iron, copper, and silver are mined, and marble is quarried. Pop. (1896) 421,412. Capital, Épinal.

Vosges Mountains (Germ. *Vogesen*): a range of mountains on the left bank of the Rhine, situated partly in Northeastern France, partly in Southwestern Germany, and running parallel with the Black Forest on the opposite side of the Rhine in Baden, which they resemble, not only in direction, but also in form and geological structure. By the depression between Montbéliard and Mühlhausen they are sharply separated from the Jura Mountains, and their eastern slopes toward the plain of the Rhine are steep and abrupt. But to the N. they connect with the Hardt in Rhenish Bavaria, and to the S. W. by the plateau of Langres through the hills of Faucilles. They are generally rounded and of a regular shape, whence they are called *ballons*, covered with forests of oak, beech, and fir on the sides, and affording excellent pastures on their tops during the six months of the year in which they have no snow. Ballon de Guebviller, the highest peak, reaches 4,700 feet; Ballon d'Alsace and Ballon de Servance are not much lower. Mineral and thermal springs are numerous, and copper, iron, and lead ores, and rock-salt abound. The Meurthe, Moselle, Saar, Ill, and Ognon descend from them. See Wolff, *The Country of the Vosges* (1891).
Revised by M. W. HARRINGTON.

Vosmaer, vōs'maar, CAREL: man of letters; b. at The Hague, Holland, Mar. 20, 1826; d. at Montreux, June 12, 1888. He studied jurisprudence at the University of Leyden, obtaining the degree of doctor; and was for many years attached to the court of cassation at The Hague. In 1873, however, he resigned, and gave the rest of his life to letters. His first serious production was *Eene studie over het schoone en de kunst* (Amsterdam, 1856), which showed artistic interests later of great importance in his work. His next success, however, was with a series of sketches published in the periodical *Nederland*, and collected in 1860 under the title *Eenige schetsen*. Of a similar character were *Vogels van diverse pluimage* (1872); *Een Zaaier: Studiën over Multatuli* (1874); and *Vlugmaren* (3 series, 1879–81–83). The romance of art, *Amazone* (1880), had very great success and has been translated into several languages (English, by Miss E. J. Irving, London, 1884). In verse also, which Vosmaer employed in his *Londinias*

(1873)—impressions of a journey to London—and *Nanno: Eene Grieksche Idylle* (1882), he showed delicacy and technical skill of an unusual kind; though, on the whole, the best evidences of his imaginative powers are to be found in his translations of Homer's *Iliad* (1878–80) and *Odyssey* (1888). It is perhaps as a critic and historian of art that Vosmaer will be longest remembered. In this field his most important works are *Rembrandt Harmens van Rijn: ses précurseurs et ses années d'apprentissage* (1863); *Rembrandt Harmens van Rijn, sa vie et ses œuvres* (revision of the preceding, 1868; new enlarged ed. 1877); *Les œuvres de W. Unger* (1873–78); *Frans Hals* (1874); *Over kunst schetsen en studiën* (1882). A biography of Vosmaer, with bibliography of his works, is given by J. Ten Brink, *Geschiedenis der Noord-Nederlandsche Letteren in de XIXe eeuw* (Amsterdam, 1888). A. R. Marsh.

Voss, Johann Heinrich: poet and scholar; b. at Sommersdorf, Mecklenburg, Feb. 20, 1751. The misfortunes of his father compelled him to become a tutor in order to obtain means to finish his education, but he nevertheless acquired a comprehensive knowledge in classical and modern languages and literatures, and had established relations with many of the leaders of German literature, when in 1778 he was appointed rector of the gymnasium at Ottendorf in Hanover. In 1772 he removed to Eutin, near Lubeck, as rector of the gymnasium there. From 1802 to 1805 he resided in Jena, where he received a pension from the Grand Duke of Saxe-Weimar. In 1805 he accepted a chair in Classical Literature at the University of Heidelberg, and here he died Mar. 29, 1826. He had an uncommon mastery of the German language and a fine sense for the formal correctness of verses. His translation of Homer (4 vols., 1793) was the great work of his life. After numerous attempts to translate Homer in verse and prose, which had been made since the time of the humanists, Voss succeeded for the first time in making a classical version of the famous epics, and so great was the influence of his translation that it has frequently been compared with the influence of Luther's translation of the Bible. His translations of Virgil's *Eclogæ* and *Georgica*, of Ovid's *Metamorphoses*, of Hesiod, Theocritus, Bion, Moschus, etc., were less successful. His power of imagination and emotion was not great. His translation of Shakspeare, finished by his son (9 vols., 1818–29), is unimpressive, and so are his own poems, collected in 4 vols. (1825), though one of them, the idyl *Luise*, became very popular. His critical works show the same character—his attack on Heyne, his polemics against Creuzer, *Mythologische Briefe* (2 vols., 1794), *Antisymbolik* (2 vols., 1824–26), etc. They are clear, and rest on solid knowledge, but they lack elevation and are singularly unsuggestive. A striking picture of the man's noble and open but somewhat circumscribed character is given in his *Wie ward Fritz Stolberg ein Unfreier* (1819), which he wrote when his friend Friedrich Stolberg was converted to Roman Catholicism. His letters were published by his son in 3 vols. (1829–33). See W. Herbst, *Johann Heinrich Voss* (1876); A. W. Schlegel, *Werke*, 10, 115; R. Prutz, *Der Göttinger Dichterbund*. Revised by Julius Goebel.

Vos'sius, Gerard Johannes: classical scholar; b. near Heidelberg, Germany, in 1577, of Dutch descent; studied classical languages and literature at Leyden and Dort; was appointed in 1600 rector of the school at Dordrecht, and in 1615 director of the theological school at Leyden, later also Professor of Eloquence at the university, but became entangled in the controversies between the Arminians and Gomarists. Through Archbishop Laud he received a prebend in the Cathedral of Canterbury, and in 1629 went to England to be installed, but returned to Holland and was made Professor of History (1631) at the newly founded College of Amsterdam, in which city he died Mar. 27, 1649. Vossius is the polyhistor of Dutch scholars. The most remarkable of his works are *Aristarchus sive de Arte Grammatica* (1635; 2 vols., 1834); *Etymologicum Linguæ Latinæ* (1662; 2 vols., Naples, 1763); *Commentariorum Rhetoricorum sive Oratoriarum Institutionum Libri VI.* (1606); *Ars Rhetorica* (1623); *De Historicis Græcis Libri IV.* (1624; ed. by Westermann, 1838); *De Historicis Latinis Libri III.* (1627); *De Artis Poeticæ Natura* (1847). His complete works appeared at Amsterdam in 6 vols. (1695–1701). His letters were published in two collections (London, 1690, and Augsburg, 1691). His rich collection of valuable MSS. are in the library of Leyden. See Toll, *De Vossio, perfecto grammatico* (Amsterdam, 1778).—His six sons were all prominent men, but only the youngest, Isaac Vossius, survived him. He was born at Leyden in 1618, and received the instruction of his father. In 1648 he went to Stockholm on the invitation of Queen Christina, but fell out with Salmasius, and returned to Holland in 1658. In 1670 he removed to England, was made canon of Windsor in 1673 by Charles II., and died there Feb. 21, 1689. His principal works, besides editions of Justin, Catullus, and the geographers Scylax and Mela, are *De vera Ætate Mundi*; *De Septuaginta Interpretibus*; *De Sybillinis aliisque Oraculis*; *De Poematum Cantu et Viribus Rhythmi*; and *Variarum Observationum Liber*. See de Crane, *De Vossiorum Juniorumque familia* (1820). Revised by Alfred Gudeman.

Vote [Lat. *votum*]: a suffrage; a statement of a choice by an individual who, with others having a like power, thereby renders a decision upon some pending question, or makes a selection of a person for some representative or official position. Although the terms voting and votes are frequently used in matters connected with the private law—as, for example, by the stockholders and directors of corporations—the terms are most frequently and significantly employed to describe the means and instruments by which many officials are chosen at public elections and measures are passed in legislative bodies. In Great Britain the voting for members of the House of Commons was for a long time *vivâ voce*. Each voter came up to the polling-place or booth, and cast his vote by naming aloud the candidate or candidates of his choice; and the names thus announced were immediately registered in the polling-book. This method was long upheld as being peculiarly in harmony with the English character, but it plainly subjected tenantry and others to an enormous political pressure from their superiors and landlords. Parliament finally abolished the whole system, except for the parliamentary elections in the universities, and introduced the ballot by the statute of 35 and 36 Vict., ch. 33, § 2 (1872), which goes to the very opposite extreme, and prescribes very minute and careful provisions for rendering the votes absolutely secret. At an early day after the adoption of the U. S. Constitution the *vivâ-voce* vote existed in a few of the States, but the ballot has long been established in the U. S., and now prevails in all elections, national, State, and municipal. (For an account of the means to insure secrecy and prevent fraud in voting, see the articles Ballot Reform and Voting-machines.) Another common and important species of vote is that used for the determination of questions—and especially for the passage of bills—in legislative assemblies. In the British House of Commons, in the U. S. Congress, and in all the State Legislatures the votes must be given by the members personally while present at a session, but in the British House of Lords votes by proxy are permitted. There are three forms of the legislative vote—by a rising and count, by a collective and simultaneous utterance of the *ay* or *no*, and by a call of the roll, each member responding "ay" or "no" when called, so that his name and response may be entered on the records. The U. S. constitutions, statutes, and parliamentary rules contain special provisions by which the latter form may or must be resorted to in the decision of certain classes of questions, and especially in the final passage of bills. Stockholders of corporations are generally permitted to vote by proxy in the election of trustees or directors and in the determination of other matters left to them by the charters. For an account of the methods of voting by which minority representation can be secured, see the article Representation.

Revised by F. M. Colby.

Voting-machines: contrivances by which voters may mechanically record their choice of candidates, and which usually also automatically count the votes. The introduction of practical voting-machines was an outcome of the general movement for ballot reform, which seeks independence and secrecy for the voter, and the prevention of fraud in casting and counting votes. The Australian ballot system has done much toward accomplishing all these results, but still further improvements appear to be possible by machine voting. Moreover, the habit of independence in voting which has been developed by the Australian system has itself generated the need for further improvement of voting methods. The separate marking of names, especially where a "split" ticket is cast, is far less simple and rapid than casting a straight party ballot. Machines help to simplify and shorten the process.

The general principle underlying the several machines in actual use is that of recording or registering votes for

candidates by pressing buttons, the names of all the candidates being displayed upon a face-plate, corresponding in arrangement to a blanket ballot (for description of which see Ballot Reform). Ballot-machines can be adapted to all the variations in form of which the blanket ballot is capable.

Chief Advantages.—The following are the chief advantages which, attained by different devices in the various machines, are secured by mechanical voting: (1) Independence. The voter may be required to indicate his choice for each office separately, and the names being all before him, it is as easy to cast a split ticket as a straight one; in other words, the machine has all the advantages of the blanket ballot in this regard. It may of course be arranged, if desired, so that pushing a single button casts a full party ticket, but this is not usual. (2) Secrecy. No one can tell what vote the person is casting at the time, nor can his ballot be afterward identified. This last has not always been accomplished by the secret paper ballots, as marks are sometimes made upon them by which they may be identified in the canvass, so that a bribed voter can give evidence of keeping his contract. (3) Simplicity of voting. Pushing a button is a simpler and more definite act than marking with a pencil. The voter can not by mistake vote for two candidates for the same office, or so mark his vote that his intention is doubtful, as often happens with the paper ballot. There is no need of writing or pasting in names, as in the separate party ballot system. If the voter is illiterate or needs time to decide upon his vote, he can, before voting, study the chart corresponding to the face of the ballot-machine, which is usually posted outside the poll. A voter who can not read may, by determining the relative location of the names, be sure of voting for the men he desires. Symbols or colors may be used to designate parties, as with the blanket ballot. (4) Impossibility of multiple voting. Mechanical devices prevent the casting of more than one vote by the same man, or render possible in canvassing its immediate detection. (5) Rapidity of voting. (6) Cheapness, saving largely, as it does, the cost of ballots and reducing the amount of clerical work, as well as other expenses. (7) Simplicity and rapidity of counting. Canvassing under the Australian system is very complicated and slow. By the machines the votes for each candidate are automatically registered by serial numbers, so that the total can be read instantly, or they are all recorded in a row and can be rapidly counted. (8) Impossibility of fraud in counting. The complexity of the blanket paper ballot often renders it possible for corrupt election officers dexterously to change the count. This is probably impossible with the machines.

Fig 1.—McTammany voting-machine.

Types of Machines.—The use of three types of voting-machines has already received legislative sanction in different States. Others have been devised, but have obtained no general attention.

The Myers American ballot-machine was perhaps the first to claim public interest. It has been employed especially in New York State, where its use was first legalized in 1892. It consists of a small room or cabinet to conceal the voter, on one wall of which are the names of the candidates, with a push-knob opposite each. The names are arranged vertically according to parties, and horizontally according to offices, precisely as in a blanket ballot. By pushing a knob the voter makes one count for the desired candidate on the automatic register on the other side of the partition wall. By means of levers the pushing of one knob locks the knobs for all candidates for that office, but they are automatically set free by the closing of the door when the voter leaves the compartment. On opening the door which covers the back of the partition the result can at once be read off. A further description of the Myers ballot-machine, with illustrations, is given in the article Ballot Reform.

The McTammany ballot-machine is made in Massachusetts, and its use was authorized by that State in 1893. It is much smaller than the Myers machine, consisting of a vertical steel box 14 inches square and 5 inches deep, fastened on a standard. Though the machine is in full view the ballot is secret. There is one slot on the face for each *office* only. Underneath this slot is a sliding card bearing the names of the candidates for that office, only one name being visible at a time. By turning a hand-wheel the voter brings into view the name of the desired candidate for each office, and then pushes a knob, making a hole in the proper column on the tally-sheet. When the voter has finished, an officer by means of a lever moves the tally-sheet forward, ready for the next voter. The vote for each candidate can be ascertained by counting personally the punches under his name; or the roll containing the tally can be placed in a mechanical ballot-counter, and, by turning the handle till the sheet is unwound, the vote for all the candidates will be automatically counted. It is evident that this machine, as now in use, is specially adapted to Massachusetts and other States having an educational suffrage qualification, as the voter must be able to read the names of the candidates. This corresponds precisely to the form of blanket ballot in use in Massachusetts.

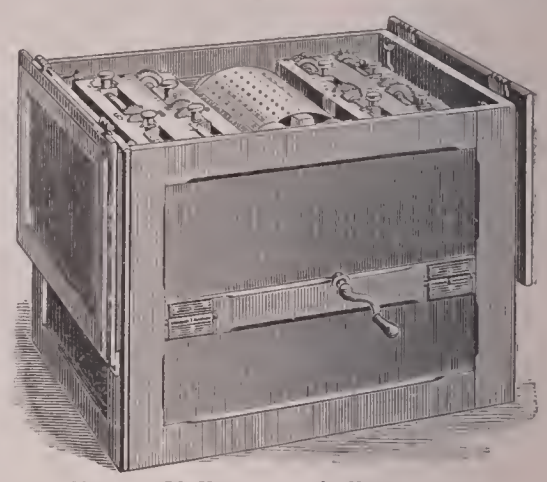
Fig. 2.—McTammany ballot-counter.

The votograph, or American ballot protector and recorder, formerly known as the Rhines machine, was made legally usable in Michigan in 1893. It is a box with a horizontal face on which the names of the candidates are arranged, as with the Myers machine, by parties and offices. Slips bearing the names are inserted in the push-buttons themselves. Below are separate tally-rolls for each candidate, with serial numbers printed upon them in a vertical row. Pushing the button places a punch in position for each name desired, so that when all the candidates have been selected the closing of the machine lid puts a hole through the proper number on each roll. Mistakes can thus be corrected before closing the lid. When the election is over each roll is cut off ten numbers below the last one punched, so that it may be evident that it has not been divided in the midst of the votes. Over these blank numbers the election officers sign their names. The tally-sheet for each candidate will then appear as in the diagram.

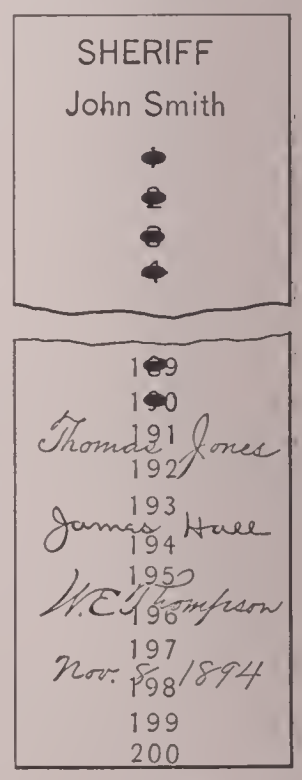

Fig. 3.—Votograph tally-roll.

Considering their recent invention, the extent to which voting-machines are in actual use is naturally comparatively slight. In no State had they been universally employed in the year 1895; nor was their use compulsory for any jurisdiction, but several States had made it a matter of local option. New York in 1892 authorized any town to adopt the Myers machine for town elections, and in 1894 permitted counties and cities, save New York and Brooklyn, to adopt it in both local and State elections. There was some doubt as to whether machine voting was voting "by ballot," and accordingly constitutional; and though no case was brought in the courts, the constitutional convention of 1894 inserted an

amendment providing for the lawful use of any machine-voting system that secured the secrecy of the ballot. A similar constitutional amendment has been adopted in Delaware. Massachusetts has authorized towns to use the McTammany machine for local elections. Michigan permits the use of the Rhine votograph or of the Myers machine for town and city elections. Connecticut in 1895 legalized the use of either the McTammany or the Myers machine for local elections. E. DANA DURAND.

Voting Trust: See the Appendix.

Voucher [from O. Fr. *voucher, vocher* < Lat. *voca're*, call]: in the ancient common law, a term denoting a peculiar proceeding in an action brought to recover land, whereby the defendant "vouched," or summoned, his own grantor or lessor, who had warranted the title, to appear and defend his title against the attacks of the plaintiff. The defendant thus calling in his predecessor to defend the suit was also named the voucher, while the party summoned was styled the vouchee. This special process and the names belonging to it have been abrogated by the modern amendments made in the system of legal procedure. The term also denotes—and this is now its ordinary signification—any written memorandum, receipt, discharge, or evidence of the payment of money, and also the books of account in which are entered such payments and receipts, used in actions or other proceedings for the judicial settlement of accounts. Every writing showing the payment of money by the person whose accounts are investigated, and which thereby strengthens or even supplies the place of the oral testimony, is a voucher. *People* vs. *Green*, 5 Daly (N. Y.) 194. Revised by FRANCIS M. BURDICK.

Vouet, voo'ā', SIMON: painter; b. in Paris, Jan. 9, 1582; son and pupil of Laurent Vouet. He went to London when only fourteen years of age, already proficient in his art and able to earn his living. In 1611 he was taken by the Baron de Saucy, ambassador to the Sublime Porte, to Constantinople, where he received many commissions. He went to Venice in 1612 and studied the works of Paolo Veronese, and passed some time in Rome and Genoa. He was received with honor in both cities and named president of the Roman Academy. Louis XIII. recalled him to Paris and appointed him court painter. Vouet did much to advance the progress of art in France. Among his pupils were the Lebruns, Lesueur, and Mignard. D. in Paris, June, 30, 1649. For further information, see *The Historic Gallery of Portraits* (vol. iv., London, 1807). W. J. STILLMAN.

Vourla: town; in Asia Minor, vilayet of Smyrna, on the south side of the Gulf of Smyrna. It exports large quantities of raisins and olives. Its excellent harbor, formed by the peninsula and the islands of Ourlac, is a favorite station of European men-of-war. The town occupies the site of ancient *Clazomenæ*, whose inhabitants, on the approach of Alexander the Great, removed to one of the Ourlac islands. The causeway, built out by the monarch to capture the city, still exists, and has become a sandy isthmus. Between Vourla and Smyrna there are numerous warm springs much used for bathing. Pop. 25,000. E. A. GROSVENOR.

Voussoir: one of the ring-stones of an arch, the central one being the keystone. See ARCH.

Vowel: See CONSONANT and PHONETICS, as well as the articles on the letters A, E, I, O, U, and Y.

Voy'sey, CHARLES: clergyman; b. in London, England, Mar. 18, 1828; educated at Stockwell Grammar School; graduated at St. Edmund Hall, Oxford, 1851; took orders in the Church of England; was curate of Hessle, near Hull, 1852–59, of Craigton, Jamaica, 1860–61; became incumbent of St. Mark's, Whitechapel, London, 1861; was ejected in consequence of having preached a sermon against the doctrine of endless punishment; held for a short time the curacy of Victoria Dock parish, London, and became vicar of Healaugh, Yorkshire, 1864. He began in 1865 the publication of *The Sling and the Stone* in monthly parts, each consisting of two sermons, and continued the series until 1871. In consequence of these sermons containing opinions which were held to be inconsistent with the Thirty-nine Articles, Mr. Voysey was prosecuted in the chancery court of Yorkminster by the secretary of the Archbishop of York. Decision having been pronounced against him Dec. 1, 1869, he appealed to the judicial committee of the privy council, which confirmed the decision and sentenced the appellant to be deprived of his living and to pay the costs (Feb. 11, 1871), giving him, however, a week in which to retract his opinions. Since that date Mr. Voysey has preached and lectured upon his own responsibility in halls in London, and since Apr., 1885, at the Theistic Church, Swallow Street, Piccadilly, being supported by the Voysey Establishment Fund, to which there were numerous and wealthy subscribers. His sermons, which were increasingly "heretical" in their tone, were printed weekly and had a wide circulation. He published some controversial pamphlets, and conducted for a few months in 1876 the *Langham Magazine*, an organ of free religious thought which had but a brief existence. He has written *The Mystery of Pain, Death, and Sin*, and *Theism, or the Religion of Common Sense*. Revised by W. S. PERRY.

Vuillefroy, vül'frwaa', DOMINIQUE FÉLIX, de: animal and landscape painter; b. in Paris, Mar. 2, 1841; pupil of Hébert and Bonnat; received a medal at the Salon of 1870, a second-class medal in 1875, and a first-class medal at the Paris Exposition of 1889; became a member of the Legion of Honor in 1880. *The Return of the Herd* (1880) and *In the Meadows* (1883) are in the Luxembourg Gallery, Paris. Vuillefroy's work is virile in style and of excellent technical quality. W. A. C.

Vulcan (Lat. *Vulca'nus*): in Roman mythology, the god of fire, whether conceived of as a beneficent or as a devastating agent, and of those arts which depend on the use of fire. The principal celebration in the worship of the god was the Volcanalia, on Aug. 23. In course of time Vulcan became completely identified—in literature and art at least—with the Greek god HEPHÆSTUS (*q. v.*). G. L. H.

Vulcan [named from Vulcan, the god of fire]: a planet supposed to be revolving around the sun, within the orbit of Mercury. About 1859 Leverrier announced that a certain motion of the perihelion of the orbit of Mercury could be accounted for by the existence of another planet still nearer the sun, even as the perturbations of Saturn had enabled him to discover the planet Neptune. The planet has been looked for on many occasions, especially during total eclipses of the sun, and some astronomers have believed that they saw it. But it is now fairly well settled that the supposed planet has no real existence, so well settled, in fact, that the question no longer appears in astronomical literature. S. NEWCOMB.

Vulcanite and Vulcanization: See INDIA-RUBBER and DENTISTRY.

Vulca'no, or **Volcano**: the southernmost of the Lipari or Æolian islands; in the Mediterranean Sea; in lat. 38° 22′ N., lon. 15° 0′ E.; 12 miles off the northern coast of Sicily. It is 7 miles long and 3 miles broad, and contains, nearly in the center, a crater nearly 1,200 feet high and about one-fourth of a mile in circumference, which constantly emits smoke and vapors charged with sulphur, ammonia, vitriol, and alum. The southern part of the island is very fertile, and produces excellent grain, grapes, fruit, and flax. The interior is sterile, and on the northern side the island is connected by a row of low rocks with the Vulcanello, a minor crater, likewise emitting smoke and vapors. The eruptions of Vulcano (of which there was one in 1888) alternate with those of Stromboli. Revised by M. W. HARRINGTON.

Vulgar Fractions: See FRACTIONS.

Vulgate [from Late Lat. *vulga'ta* (sc. *edi'tio*, edition), liter., fem. perf. partic. of *vulga're, vulga'tum*, make common or popular, deriv. of *vul'gus*, common people]: Latin translations of the Bible. The Latin is one of the three oldest versions of the Old Testament, the Greek, the Syriac, and the Latin, and one of the two oldest of the New Testament, the Syriac and the Latin. The history of its origin is lost, but it is certain that it was made in Africa, and in the second century. It would naturally be assumed that it was made in Rome, but at that period the Church in Rome was essentially Greek, the Roman bishops bore Greek names, the earliest Roman liturgy was Greek, and the few remains of Roman Christian literature are Greek. The same statements hold true of Gaul. The Church in Africa, however, seems to have spoken Latin from the first. At what exact time this Church was founded is not known, but at the close of the second century Christians were found there in all places and in every rank. Tertullian of Carthage, the first of the Latin Fathers, directly cites or alludes to every part of the New Testament which we now have, except the second and third Epistles of St. John, the second of St. Peter, and St. James. (See H. Rönsch, *Das Neue Testament Tertullians*, Leipzig, 1871.) This version, the *Vetus Latina*, or *Old Latin*, was preserved generally unchanged in Northern Africa, but

when introduced into cultured Italy its provincial rudeness would offend, and the familiarity of the leading bishops there with Greek would make the revision, so likely to take place, easy of accomplishment. Hence in the fourth century a revision of the Gospels seems to have been made in Northern Italy, and to have been distinguished by the name *Itala*, *Italian*, although scholars are not agreed as to the exact meaning of this term. This version St. Augustine recommends for its accuracy and perspicuity (*De Doctr. Christ.*, ii., 15), and the text of the Gospels as quoted by him, on occasion, in his works bears out his representation; but in the other books the difference can not be traced with exactness. The Latin version of the New Testament appears to have arisen from individual and successive efforts; for St. Augustine says that any one in the first ages of Christianity who gained possession of a Greek MS., and thought he had a fair knowledge of Greek and Latin, ventured to translate it. And as the LXX. about B. C. 250 furnished the mould in which the thoughts and expressions of the Greek Testament are cast, so the LXX. may have taken a Latin form for the Latin-speaking Jews, and thus may have made ready a dialect for the Latin version of the New Testament. But however this may have been, there is found, in fact, a substantial similarity between the character of the Old Testament and the New Testament in Latin, and this justifies the belief that there was one Latin version of the Bible current in Africa in the last quarter of the second century.

The name Vulgate—that is *Vulgata editio*, the current text of Holy Scripture—originally answered to the designation of the Greek version of the Old Testament, the κοινὴ ἔκδοσις. As the *vetus versio* of the Old Testament was made from the LXX., and in substance identified with it, St. Jerome introduces Latin quotations from the Old Testament under the name of LXX. or *Vulgata editio* indifferently, and thus this term was transferred from the current Greek to the current Latin of the Old Testament. This use of the expression *Vulgata editio* continued to later times. It is found in St. Augustine, Ado of Vienne, and in Roger Bacon, and it is recognized even by Bellarmine. The Council of Trent, therefore, historically erred in styling St. Jerome's Bible *Vulgata editio*. The Latin Fathers themselves commonly spoke of St. Jerome's version as *nostra versio*, our version, or *nostri codices*, our books.

After the translation received a definite shape in Africa it was jealously guarded by ecclesiastical use, and was retained there even when St. Jerome's version was almost universally received elsewhere. But at the same time the text suffered by the natural corruptions of copying and by the interpolation of glosses, especially in the Gospels, and thus the different forms of the text became almost as numerous as the copies. The one remedy for this confusion was to go back to the first form in Greek.

St. Jerome had not been long in Rome (A. D. 383), when Pope Damasus applied to him for a revision of the current Latin version of the New Testament by means of the Greek original. St. Jerome undertook the work, and confined himself strictly to the labors of a reviser. In the prosecution of his work he collated early Greek MSS. and introduced the necessary changes, but he preserved the old renderings where the sense was not injured by it. Some of his alterations were made on purely linguistic grounds, but it is impossible to ascertain on what rules he proceeded; others involved questions of interpretation; the greater number, however, consisted in the removal of the interpolations by which the first three Gospels especially were corrupted. These interpolations must have been far more numerous than are found in existing copies, but instances still occur to show the service he rendered in checking the perpetuation of apocryphal glosses and additions.

St. Jerome's Preface, addressed to Damasus, speaks only of a revision of the Gospels; and St. Augustine, writing to St. Jerome, alludes to the Gospel, and there is no preface to any other book such as is elsewhere found before St. Jerome's versions or editions; but this omission is probably due to the fact that the rest of the New Testament was preserved comparatively pure. St. Jerome himself enumerates among his works his *Restoration of the New Testament to Harmony with the Greek*.

The old version of the Old Testament was made from the unrevised form of the LXX., and thus included many false readings and other imperfections. Therefore about the same period in which St. Jerome revised the New Testament he put his hand to the Old Testament. He first undertook and accomplished a revision of the Psalter. This was done with the aid of the LXX., but not very thoroughly. It was called the *Roman Psalter*, probably because made for the use of the Church in Rome at the request of Damasus. Afterward, urged by Paula and Eustochium, he made a new and more careful version in 392, which became very popular, and which Gregory of Tours is said to have introduced into France, hence called the *Gallican Psalter*. From this work he proceeded to a revision of the rest of the Old Testament by means of the LXX., which he appears to have completed in four or five years. About the year 374 he had begun the study of Hebrew, which he zealously pursued for some years, and about 389 published several treatises connected with this study. These paved the way for his version of the Old Testament direct from the Hebrew, which he now undertook, and in about 405 seems to have completed. Portions of this, as the books of Solomon, Judith, and Tobit, were done in great haste, but the greater part was accomplished successfully.

The critical labors of St. Jerome were received with an outburst of reproach. He was accused, as other such laborers have been, of disturbing the peace of the Church and of undermining the foundations of the ancient faith. Acknowledged errors were looked upon as hallowed by usage, and few had either interest or courage to seek the purest text of Holy Scripture. Even St. Augustine was carried away by popular prejudice and endeavored to discourage St. Jerome from his presumptuous work, as it appeared to him; but the improved translation gradually came into use side by side with the old, and at length supplanted it; and this it did without any direct ecclesiastical authority.

The Latin Bible which thus became current under the name of St. Jerome was a composite work containing elements that belonged to every period and form of the Latin version: (1) *Unrevised Old Latin*, Wisdom, Eccles., 1 and 2 Maccabees, and Baruch; (2) *Old Latin revised from the LXX.*, the Psalter; (3) *St. Jerome's Translation from the original Greek*, Judith, Tobit; (4) *St. Jerome's Translation from the original Hebrew*, the Old Testament except the Psalter; (5) *Old Latin revised from the Greek original*, the Gospels; (6) *Old Latin thus revised cursorily*, the rest of the New Testament.

The MS. remains of the Old Latin text of the Old Testament are very scanty. There still exist important MSS. of the New Testament: Of the *African text*, *Codex Vercellensis*, at Vercelli, of the fourth century; *Cod. Claromontanus*, in the Vatican, of the fourth or fifth century; *Cod. Bobiensis*, at Turin, of the fifth or sixth century, a remarkable revision of this text; of the *Italic text*, *Cod. Brixianus* and *Cod. Monacensis*, of the sixth century. Of *St. Jerome's text* we have *Cod. Amiatinus*, at Florence, of the seventh or beginning of eighth century; *Cod. Toletanus*, now at Madrid, in Gothic letter, of about the tenth century (Berger would date it eighth century); and *Cod. Fuldensis*, of the sixth century, containing the New Testament merely.

At the invention of the art of printing, St. Jerome's Bible was the first book produced from movable types, about 1455. It was printed again and again by various hands and in various forms, but it was not until the heat of controversy in the sixteenth century exaggerated the differences in the text and in the interpretation that an authorized edition was determined on for the Church of Rome. This was undertaken by Pope Sixtus Quintus, and put forth in 1590. Though declared by the pontiff *authentical and in a manner absolutely perfect*, it contained such typographical and other errors as to compel the publication of a second and revised edition in 1592, of another in 1593, and still another in 1598, with a triple list of *errata*, one for each of the preceding editions. This is the standard of the *Vulgate*, or Roman Catholic Bible, of the present day.

The MS. form of St. Jerome's Bible—which, upon the whole, stands highest in the estimation of scholars—is the *Codex Amiatinus*, mentioned above. The editors employed by Pope Sixtus rightly valued this MS., and in some passages solely or chiefly followed its authority. The portion containing the New Testament has been repeatedly published, and is easily accessible, as edited by Fleck (1840), common text with the Amiatine variations; by Tischendorf (1854 and 1873), Amiatine text with learned prolegomena. Facsimiles in Zangemeister and Wattenbach, *Exempla Codd.*, lat. pl. 35. and English Palæographical Society, ii., pl. 65, 66. See also H. T. White, *The Codex Amiatinus and its Birthplace* in *Studia Biblica* (ii., p. 273, Oxford, 1890).

Some specimens of the diction of the Vulgate are subjoined, under different heads, extending over the first ten chapters of St. Matthew, as given in the Greek and the Latin text of Prof. Tischendorf in his *N. T. Triglottum*, published in 1854: (1) *It preserves the exact order of the original in very many instances.* At the opening of the Gospel we find *Liber generationis Jesu Christi filii David, filii Abraham. Abraham genuit Isaac, Isaac autem genuit Jacob.* This follows the Greek word by word: Βίβλος γενέσεως Ἰησοῦ Χριστοῦ υἱοῦ Δαυὶδ υἱοῦ Ἀβραάμ. Ἀβραὰμ ἐγέννησεν τὸν Ἰσαάκ, Ἰσαὰκ δὲ ἐγέννησεν τὸν Ἰακώβ. So in clauses and phrases: vi. 6, Σὺ δὲ ὅταν προσεύχῃ, *Tu autem cum orabis*; iv. 22, οἱ δέ, *illi autem.* The advantage of following the order of the Greek sometimes appears conspicuously, as in iv. 10, *Dominum Deum tuum adorabis et illi soli servies*—an order preserved in English only by the Rheims version, and far more forcible than the common order. In iii. 1, Ἐν δὲ ταῖς ἡμέραις ἐκείναις is given by *In diebus autem illis*: here (*a*) the postpositive particle *autem* stands for the postpositive δέ, but the Vulgate, faithful to Latin usage, puts it after the noun, not after the preposition, as in the Greek; and (*b*) the demonstrative follows its noun like the Greek; now, common as this order is in Greek, it is comparatively rare in Latin, though found in the best writers (Cicero, Livy). But we meet here and there with a departure from the arrangement of the Greek without apparent reason: in i. 12, Μετὰ δὲ τὴν μετοικεσίαν is given by *Et post transmigrationem*, instead of *Post transmigrationem autem*; and in ii. 5 and iv. 20, οἱ δέ is given by *At illi*, instead of *Illi autem*; and this is the more strange, as the stricter form is common in the Vulgate.

(2) *Many of its renderings are peculiarly exact in sense or form, or both, in reference to the Greek.* In i. 11, ἐπὶ τῆς μετοικεσίας Βαβυλῶνος, is given by *in transmigratione Babylonis*, which, though unclassical, as mentioned again below, preserves the euphemism of the Greek Testament and of the LXX. for "captivity," and of all our versions, Wycliffe's and the Rheims alone have retained it. In ii. 19, Τελευτήσαντος δὲ τοῦ Ἡρώδου, the gen. abs. is exactly given by the abl. abs., *Defuncto autem Herode*, and so in vi. 3. In iii. 2, Μετανοεῖτε is given by *Pœnitentiam agite*, and this Latin was rendered by Wycliffe "Do penance," which the Rheims followed; but, though this English phrase has now, even to the Roman communion, come to mean rather mortification of the body than sorrow of mind, yet the Latin is a good classical equivalent of the Greek, and is actually found in Petronius, *Sat.*, 132, in Tacitus, *De Orat.*, 15, in Pliny, *Ep.*, vii. 10, and has the express sanction of Quintilian in a critical observation in ix. 3, 12. In iii. 9, μὴ δόξητε is given in form by *ne velitis*, and *ne* is so used in v. 42; vi. 13; vi. 25, while, as mentioned below, the freer and quite classic *noli* and *nolite* with the inf. prevails in the Vulgate. In iii. 15, Ἄφες ἄρτι is ingeniously rendered by *Sine modo*, and in iv. 17, Ἀπὸ τότε by *Exinde* (Plaut., Cic., Verg.), and vi. 25, Διὰ τοῦτο by *Ideo*. In iv. 16, ὁ λαὸς ὁ καθήμενος is nicely given by *populus qui sedebat*, who were sitting, and viii. 24, ὥστε τὸ πλοῖον καλύπτεσθαι by *ita ut navicula operiretur*, was being covered, while the A. V. has "sat," and "was covered." In viii. 16, δαιμονιζομένους is rightly rendered *dæmonia habentes*, "possessed with demons," while all our versions have here "devils," as if it were the plural of ὁ Διάβολος, the devil; but the plural in this sense nowhere occurs in Holy Scripture; and though "devils" is found also four times in our version of the Old Testament, the Vulgate has likewise *dæmonia* uniformly there.

(3) *Certain of its renderings seem more or less inexact or faulty.* In i. 20, Ταῦτα δὲ αὐτοῦ ἐνθυμηθέντος is given by *Hæc autem eo cogitante*, but this would be the proper rendering of the pres. participle, as is given by the Vulgate in Acts x. 19, while here the proper rendering would have been, *Cum autem hæc cogitavisset*; we also find the aor. part. of the Greek given by the pres. part. in the Vulgate in i. 24; ii. 3, 4, 8, 9, 10, 11 *bis*, 16 *bis*, 21, 22, 23; iii. 7; iv. 3, 9, 21; v. 1, 2, 24. These instances are enumerated in full, because there is an impression, even among scholars, that our loose use in English of the pres. part. is largely due to the influence of the A. V.; yet against these twenty cases of such loose use in the Vulgate only four can be adduced from the same portion of the A. V., and one of these (iii. 15) is logically right: Ἀποκριθεὶς δὲ ὁ Ἰησοῦς εἶπεν, "And Jesus answering said." In ii. 8 the diminutive παιδίον is given by *puer*, instead of the dim. *puellus*, by which the Vulgate always renders this elsewhere, except in Tobit i. 8, where it uses *puerulus*.

(4) *Many of its renderings are strictly in accordance with Latin usage, even when this differs from the Greek.* We have the Greek part. given by *cum* and the subj.: (*a*) the aor. part., i. 18, Μνηστευθείσης γὰρ τῆς μητρός, *Cum esset desponsata mater*, and so ii. 1, 9, 13, 19; iv. 2, 12; v. 1; (*b*) the pres. part., i. 19. δίκαιος ὤν, *cum esset justus.* We have the Greek aor. part. given by the abl. abs.: καλέσας τοὺς μάγους, *vocatis magis*; so ii. 11, 12; iv. 13, 22; vi. 6. In i. 20, μὴ φοβηθῇς is given by the idiomatic *noli timere*; so v. 17; vi. 2, 7, 8, 19, 31, 34, but in iii. 9, as said above, and elsewhere, we find the Greek form imitated, *ne velitis.* In iv. 1 we have πειρασθῆναι, denoting a purpose, rendered by *ut temptaretur*, and in iii. 13, τοῦ βαπτισθῆναι by *ut baptizaretur*, though, as illustrated below, the Greek inf. of purpose the Vulgate commonly gives by an inf.

(5) *It not unfrequently gives literal renderings from the Greek in violation of the Latin idiom.* In i. 11, ἐπὶ τῆς μετοικεσίας Βαβυλῶνος is given by *in transmigratione Babylonis*, for *cum Babylona commigrassent* (Liv.); iii. 8, ποιήσατε—καρπόν, *facite fructum*, for *edere, ferre fructum* (Cic., Quint.); iii. 12, συνάξει—εἰς τὴν ἀποθήκην, *congregabit—in horreum*, for *percipere, horreo condere* (Cic., Hor.); iii. 17, ἐν ᾧ εὐδόκησα, *in quo mihi complacui*, for *qui mihi complacuit* (this Greek was rendered literally only by the Vulgate and Wycliffe—"in whiche I have plesid to me"—and no one of our versions but Wycliffe's has here retained the past tense of the original); iv. 4, οὐκ ἐπ' ἄρτῳ μόνῳ—ἀλλ' ἐν παντὶ ῥήματι, *non in pane solo—sed in omni verbo*, for the simple abl., *pane—verbo*; so v. 13, 28; vi. 7; iv. 19, Δεῦτε ὀπίσω μου, *Venite post me*, for *Sequimini me.*

(6) *It employs some words, forms, and phrases of very unusual, but still of authorized Latin.* In i. 19 αὐτὴν δειγματίσαι, *eam traducere*: this verb is so used by Livy and Martial; ib. ἀπολῦσαι αὐτήν, *dimittere eam*: this is an early and late phrase, being found in Plautus and Suetonius; ii. 16, ἀπὸ διετοῦς, *a bimatu*: this noun is used by Varro and Pliny; v. 13, ἐὰν δὲ τὸ ἅλας μωρανθῇ, *si sal evanuerit*: Cic., in *Div.*, ii. 17, says, *salsamentum* (the brine) *vetustate evanuit*; v. 43, μισήσεις τὸν ἐχθρόν σου, *odio habebis inimicum tuum*: a phrase used by Plautus; v. 45 ὅπως γένησθε, *ut sitis*, for *ut fiatis*: *esse* is so used in Cic., *De Off.*, i. 11, and elsewhere.

(7) *It employs some words and phrases quite unexampled in Early or Classical Latin, and found only in Ecclesiastical and Later Latin.* In iii. 12, διακαθαριεῖ, *permundabit*: only Later Latin for *purgabit*; iv. 2, νηστεύσας, *cum jejunasset*: only ecclesiastical for *cum jejunus fuisset*; iv. 10, Ὕπαγε, *Vade*: only poetic and used in the sense of "Go!" for *Apage, Abi hinc.*

(8) *In the use of particles it commonly follows classical usage, even in nice points.* In iii. 11, μέν—δέ, *quidem—autem*: employed by Cicero occasionally, and as if in imitation of the Greek formula; v. 13, ἐὰν δέ, *quod si*: used by the purest writers; δέ is regularly given by *autem*, and καί by *et*, but δέ, resumptive, in ii. 1 is well given by *ergo.*

(9) *Some of its uses of particles are uncommon, others unexampled.* In v. 29, συμφέρει—σοὶ ἵνα—καὶ μή, *expedit tibi ut—quam*, as now and then in Tacitus, for *magis quam*; vi. 14. ἐάν—ἐὰν δέ, *si—si autem* for *si—sin* or *sin autem*; v. 12, Χαίρετε—ὅτι, *Gaudete—quoniam*, for *quod, quia*, or *cum*; vi. 29, οὐδὲ Σολομῶν, *nec Salamon*, for *ne Salamon quidem*; nor is the familiar classical *ne—quidem* known to the Vulgate New Testament any more than our familiar *not even* is known to the Authorized Version of the New Testament, except once in a question (1 Cor. xi. 14); *nec—quidem*, however, is found in 1 Cor. iii. 2, and *ne—quidem* in the Vulgate Old Testament. One of the most remarkable peculiarities of the diction of the Vulgate remains to be noticed under this head. It is well known that verbs of hearing, saying, thinking, etc., are construed in Greek sometimes with ὅτι, "that," and a finite verb, and sometimes with the acc. and the inf.; while in Latin the latter is the regular construction. But besides its objective meaning, "that," ὅτι has, according to its context, a causal force, "because." The Vulgate, to preserve the exact form of the Greek, commonly construes these verbs with a particle, but, as if taking the wrong meaning of ὅτι, renders, for example, in ii. 22, ἀκούσας ὅτι by *audiens quia*; so v. 21, 27, 33, 38, 43; in ii. 16, ἰδὼν ὅτι by *videns quoniam.* There are at least fifteen similar examples of this use of *quia* and *quoniam* in ii.–vi. And in all this portion we find *quod* used only once in this relation, though at certain periods of the language and in certain cases this particle alone stood in such relation; that one instance is in iv. 12, where Ἀκούσας δὲ ὅτι is rendered *Cum audisset quod.*

(10) *In the use of the moods it generally conforms to classical usage.* Omitting illustrations of this conformity, the exceptions to this rule are as follows: In ii. 2, ἤλθομεν προσκυνῆσαι αὐτῷ, *venimus adorare eum*: only a poetic construction for *ut adoremus*, and so v. 17; viii. 29; ix. 13; x. 34, 35; in iii. 11, εἰμὶ ἱκανός— βαστάσαι, *sum dignus portare*: also poetic for *sum dignus qui portem*; in iv. 19, ποιήσω ὑμᾶς ἁλιεῖς ἀνθρώπων, *faciam vos fieri piscatores hominum*: rare, but found in Varro and Sallust for *faciam ut*, etc.; in three instances the subjunctive is strangely used after certain particles: ii. 16, *videns quoniam inlusus esset*; ii. 22, *audiens quia regnaret*; and iv. 12, *Cum audisset quod Johannes traditus esset.*

Such are some of the characteristics of the Vulgate appearing from an examination of a portion of one of the Gospels. Its excellences are great and marvelous, and even its defects, generally arising from a scrupulous desire to keep close to the side of the sacred original, often suggest or confirm points of the gravest importance. Prof. Lachmann, Prof. Tischendorf, and Dr. Tregelles, the three greatest names connected with the textual criticism of the Greek Testament in recent times, adopting the view of the learned Bentley, regarded the Latin in the purest and most ancient forms as the most important witness to the integrity of the New Testament next to the Greek MSS., nor did they fail to observe that the Latin in some phases goes back to a period which no Greek MS. now extant represents.

The Vulgate is to a degree not generally understood the venerable parent of our own translation, the Authorized Version. The history of the English Bible begins with Wycliffe, and the Wycliffite version, as it is now more strictly called, was made directly from the Vulgate. All the partial and preliminary versions also of Cædmon, Aldhelm, Bede, and others, it is to be remembered, were made directly from copies of the Vulgate. The influence of the Wycliffite version, representing the whole Vulgate, has been great and constant on all the subsequent English versions and revisions, furnishing apt and established words and phrases, which the new translators and revisers were neither willing nor able to lay aside.

The above indicates our indebtedness to the Vulgate in general. To be more particular, when the Vulgate was turned into its earliest English form, the Anglo-Saxon version, it was hardly possible that this act should not have greatly modified our language by introducing new words, mostly religious, and by giving us new forms of construction; and again, this work would be carried further by the Wycliffite version, and was perhaps nearly consummated in the Rheims, the last great version that preceded our own. Our Christian nomenclature itself has thus in great measure been furnished to us by the Vulgate, and many of these precious words were either invented in Latin or there first used in their higher and spiritual sense; such as *regeneration, conversion, justification, sanctification, predestination, election, propitiation, reconciliation, Saviour, salvation, Redeemer, redemption, Mediator, Spirit, cross, faith, grace, revelation, inspiration, Scripture, Testament, communion, orders, congregation*; some words are Greek, but given to us through the Latin, as *baptism, Paraclete*, and *presbyter* or *priest*; while some were coined in Latin to copy the Greek, as *transgress* from *transgredior*, in imitation of παραβαίνω.

If we say, as we may with truth, that Christianity in the first instance was received in the Greek language and through Greek thought, we may surely say that it was adopted in Europe chiefly in Latin forms; and the influence of the Vulgate upon the religious language, thought, and culture of Europe can hardly be overestimated. See Canon Westcott, *The Vulgate*, in *Smith's Dictionary*; Dr. Tregelles, *Horne's Introduction to the Scriptures*, vol. iv.; F. H. A. Scrivener, *A Plain Introduction to the Criticism of the New Testament*, 4th ed. edited by E. Miller (London, 1894), vol. ii., c. iii., pp. 43–90; *Two Letters on 1 John v. 7* (Discussion of N. African Latin), Card. Wiseman, *Essays* (vol. i., 1853); Kaulen, *Geschichte der Vulgata* (Mayence, 1868); Rönsch, *Itala und Vulgata* (Marburg, 1875); Rönsch, *Das Neue Testament Tertullians* (Leipzig, 1871); Ziegler, *Itala-fragmente* (1876); T. K. Abbot, *Evangeliorum versio antehieronymiana ex codice Usheriano, accedit versio vulgata secundum codicem Amiatinum* (2 vols., Dublin, 1884); S. Berger, *Histoire de la Vulgate pendant les premiers siècles du moyen âge* (Paris, 1893); W. A. Copinger, *Incunabula Biblica*, or *The first half century of the Latin Bible, being a bibliographical account of the various editions of the Latin Bible between 1450 and 1500* (London, 1892); J. Wordsworth and H. J. White, *Novum Testamentum secundum editionem sancti Hieronymi* (Oxford, 1889–95—four parts, Matthew, Mark, Luke, and John—have appeared); Sabatier, *Bibliorum sacr. Latinæ versiones Ant. seu Vetus Italica, etc.* (3 vols., Rheims, 1743–49). A revised edition of this great work for the Old Testament is in course of preparation under the auspices of the Munich Academy, and the superintendence of Prof. E. Wölfflin. See also E. Nestle's *Ein Jubiläum der Lateinischen Bibel* (Tübingen, 1892), and the article BIBLE.

Revised by M. WARREN.

Vul'pius, CHRISTIAN AUGUST: author; b. at Weimar, Germany, Jan. 23, 1762; studied at Jena and Erlangen; received an appointment at the library in Weimar in 1797. D. in Weimar, June 26, 1827. He wrote a great multitude of operas, romantic dramas, romances, tales, etc., and edited *Curiositäten der physisch-litterarisch-artistisch-historischen Vor- und Mitwelt* (10 vols., 1810–23), and *Die Vorzeit* (4 vols., 1817–21), which contain some interesting materials. One of his original works became very famous—*Rinaldo Rinaldini, der Räuberhauptmann* (1797). It was republished over and over again, translated into many foreign languages, and imitated by all the scribblers of Europe. It is still of interest to the student, showing whither the imagination of that age liked to wander when it was unoccupied by real business and uncultivated by true art, making evident, besides, how limited the popularity of men like Goethe, Schiller, and Herder at that time must have been.—His sister, JOHANNA CHRISTIANE SOPHIE VULPIUS, b. at Weimar, June 1, 1765, met Goethe for the first time in the summer of 1788, when she addressed him in the park of Weimar, in order to present a petition to him; removed shortly after into his house; bore him a son, August von Goethe, Dec. 25, 1789, and was officially married to him Oct. 19, 1806, a few days after the battle of Jena. Goethe chose this time in order to attract as little attention to the affair as possible, since he had always considered her his lawful wife. While for a long time Christiane had to suffer from the malicious gossip that became current in Weimar, and was repeated even in biographies of Goethe, recent publications have proved that the poet's relations to her were of a most tender nature, and that she was an excellent wife and mother. When she died (June 6, 1816), Goethe mourned her sincerely, and she was spoken of with kindness and with respect by all his friends. See E. Brauns, *Christiane v. Goethe* (1881); K. Heinemann, *Goethe's Mutter* (1892); *Schriften der Goethegesellschaft*, iv. (1889). Revised by JULIUS GOEBEL.

Vulture [viâ O. Fr. from Lat. *vul'tur*; cf. *vel'lere, vulsum*, pluck, tear out]: any one of those birds of prey which have the head bare and feed on carrion. The vultures of the Old World and those of the New were, until recently, considered as nearly related, but the former belong in the family *Falconidæ*, while the latter form a separate family, *Cathartidæ*, which contains such birds as the CONDOR, KING-VULTURE, and TURKEY-BUZZARD (*qq. v.*). The true vultures, like the other *Falconidæ*, have a bony portion, or septum, separating the nostrils, and are considered as divisible into several genera—viz., *Vultur, Gyps, Pseudogyps, Otogyps, Lophogyps*, and *Neophron*. These essentially agree in habits, living for the most part on dead animal matter, and even appearing to prefer that which is putrescent, although not confining themselves to such. When an animal has died the carcass is soon discovered by these birds, and they fly from all points of the compass. After eating to satiety they rest in a lethargic manner near the remains of the carcass, and are scarcely able to fly, and when disturbed generally vomit their ingesta before they are able to take to wing. They are birds of bold flight and soar high in the air, scanning the ground in search of food, which they find much more by the sense of sight than by that of smell. They are particularly inhabitants of the tropical and warmer parts of Asia and Africa, but some species occur in Southern Europe, notably the griffon vulture (*Gyps fulvus*), the typical species of the group and one of the largest. It is, as the scientific name implies, of a fulvous ash color, with a ruff of soft white feathers; the primaries and tail are brownish black. The length is about 3½ feet, spread of wing 6 or 7 feet. See also BRUSH-TURKEY and EGYPTIAN VULTURE. F. A. LUCAS.

Vyatka: See VIATKA.

W

: the twenty-third letter of the English alphabet.

Form.—The form W is a ligature resulting from the doubling of V. This device was first employed in mediæval times to express with Latin letters the value of Germ. consonant *-u* (= *w*), and was continued in the writing of German loan-words by those Old French dialects which preserved the sound; thence it passed into the Middle English orthography, displacing the Old English symbol *wēn* (ƿ). The use of *uu* was also known in the oldest O. Eng. texts.

Name.—The name "double-*u*," which has displaced the older *wēn* since the fifteenth or sixteenth century, is descriptive of the appearance of the symbol. It of course antedates the differentiation of V and U.

Sound.—It denotes in general the consonant form of *u* (*oo*), being characterized by the high-back position of the tongue and lip-rounding. After initial *s*, *t*, *h*, it is voiceless, as in *swell*, *twenty*, *what* (for *hwat*), *wh* being a sign for voiceless *w*. The same sound is denoted by *u* after *q*, as in *question*, *quality*, *quack*. The letter is silent before *r*, as in *wreck*, *wrong*, and in *sword*, *toward*, *answer*, *two*, *who*, *whoop*, *whole*, *whose*, *Greenwich*, etc.

Source.—(1) Teutonic *w* < Indo-Europ. *u̯*; *wolf*: Sanskr. *vṛka-*: Gr. (*F*)λύκος; *word*: Lat. *verbum*: Lith. *vardas*. (2) Teuton. *ʒw* < Indo-Europ. *ɸ* before the accent, or *gh*; *saw*: Lat. *sequor*; *snow*: Goth. *snaiws* < Indo-Europ. *snoighos* > Gr. νίφα, Lat. *nivem*. (3) *wh* < Teuton. *hw* < Indo-Europ. *ɸ*; *wheel* < O. Eng. *hwēol*: Sanskr. *cakrá-*: Gr. κύκλος. (4) In a few loan-words, as from Latin (early) *wine* (*vinum*), *wall* (*vallum*), *-wick* (*vicus*); Amer. Ind. *wampum*, *wigwam*; Celtic *welt*, *whisky*. BENJ. IDE WHEELER.

Waagen, *vaa'gen*, GUSTAV FRIEDRICH: critic and writer on art; b. in Hamburg, Germany, Feb. 11, 1794; was educated in Silesia, whither his father, a painter of some reputation, had removed in 1807; made the campaigns of 1813–14 as a volunteer; studied art subsequently under the influence of Ludwig Tieck, a relative of his, at Breslau, Dresden, Heidelberg, and Munich; was appointed director of the picture-gallery of the Museum of Berlin in 1830; became Professor of the History of Art at the University of Berlin in 1844. His principal works are *Kunstwerke und Künstler in England und Paris* (3 vols., Berlin, 1837–39), of which a much enlarged edition of the English part, *Treasures of Art in Great Britain*, appeared in 3 vols. in 1854, and a supplement in 1857; *Kuntswerke und Künstler in Deutschland* (2 vols., Leipzig, 1843–45); *Die Gemäldesammlung der kaiserlichen Eremitage in St. Petersburg* (Munich, 1864); *Die vornehmsten Kunstdenkmäler in Wien* (2 vols., Vienna, 1866–67). D. in Copenhagen, Denmark, July 15, 1868.
Revised by RUSSELL STURGIS.

Waahoo: See WAHOO and SPINDLE-TREE FAMILY.

Waal: river of the Netherlands; one of the principal arms of the Rhine; thrown off near the village of Tannerden, whence it flows past Nymwegen, Tiel, Nieuw-St.-Andries, joins the Maas, and then receives the name of *Merwede*. The Merwede passes by Gorinchen and Dordrecht, and becomes the Oude, or Old Maas.

Wabash, waw'bǎsh: city; capital of Wabash co., Ind.; on the Wabash river, and the Ft. Wayne, Cin. and Louisv. Railroad; 30 miles E. of Logansport and 42 miles W. S. W. of Fort Wayne (for location, see map of Indiana, ref. 4–F). It is in an agricultural region, and has high and grammar schools, 2 national banks with combined capital of $195,000, a private bank, a daily, a monthly, and 3 weekly periodicals, railway repair and machine shops, woolen, flour, paper, and oil mills, planing-mills, shoe and hat shops, and carriage and spoke factories. Pop. (1880) 3,800; (1890) 5,105; (1900) 8,618. EDITOR OF "PLAIN DEALER."

Wabasha, waw'bǎsh-aw: city; capital of Wabasha co., Minn.; on the Mississippi river, and the Chi., Mil. and St. P. Railway; 30 miles E. S. E. of Red Wing and 33 miles N. N. W. of Winona (for location, see map of Minnesota, ref. 10–G). It is 3 miles below Lake Pepin; is an important grain-market and trade center; and has 4 churches, court-house (cost $40,000), a national bank with capital of $50,000, a State bank with capital of $30,000, 2 weekly papers, foundry, railway machine-shop, church-furniture factory, roller flour-mill, oatmeal-mill, boat-yard, soap-works, and large lumber interests. Pop. (1880) 2,088; (1890) 2,487; (1900) 2,528.
EDITOR OF "WABASHA COUNTY HERALD."

Wabash College: an institution of learning at Crawfordsville, Ind., founded in 1832; non-sectarian, but in close affiliation with the Presbyterian Church. The college grounds comprise 33 acres. There are five large college buildings; a museum in which are collections of minerals and botanical, geological, and archæological specimens, and laboratories for the study of biology, geology, and other branches of science; Center Hall, containing the chapel, also recitation and society rooms; Peck Hall, with extensive laboratories for the study of physics and chemistry; and Yandes Library Hall, containing 36,000 volumes. The college offers three courses, leading to the degrees A. B., Ph. B., and B. S. In 1900 there were 16 professors, 11 assistants, and 200 students. George S. Burroughs, Ph. D., LL. D., was president from 1893–99, and was succeeded by William P. Kane, D. D. The amount of invested funds is nearly $500,000.

Wabash River: a river which rises in Grand Reservoir, Mercer County, O.; flows at first N. to Wabash city, where it receives Big Beaver river; turning N. W., it sweeps in a devious course across Indiana, and during the last 120 miles of its course forms the boundary between that State and Illinois. It is the largest northern tributary of the Ohio. It has been navigated at high water by steamboats as far as Lafayette, Ind.; and from Terre Haute to Huntington, Ind., it is followed by the Wabash and Erie Canal. Length, 550 miles; area of basin, 31,500 sq. miles.

Wac'camaw River: a river which rises in Waccamaw Lake and in the marshes of Bladen, Columbus, and Brunswick cos., N. C., flows into South Carolina in a direction nearly parallel to the coast, and at Mt. Gilead, S. C., after a course of 125 miles, unites with the Great Pedee, which indeed is usually called Waccamaw below the junction. It finally flows into Winyaw Bay. The Waccamaw proper is navigable to Conwayboro, S. C.

Wace, often called MASTER WACE (Waice, Gace, Guace, or Gasse): poet; b. in the island of Jersey about 1100; was taken in childhood to Caen, Normandy, where he began his studies. He was destined for the Church; continued his studies at Paris; returned to Caen, and was a reading-clerk (*clerc lisant*) in the royal chapel about 1135; was made canon of Bayeux by Henry II. of England about 1162; d. about 1175. He wrote two long poems, the *Brut*, or *Geste des Bretons*, a paraphrase, in 15,000 lines of eight syllables, of the *Historia regum Britanniæ* of Geoffrey of Monmouth, which he finished in 1155, and dedicated to Eleanore, wife of Henry II., and *Le Roman de Rou*, or *Geste des Normanz*, of nearly 17,000 lines, narrating the history of the Norman dukes to 1107, including the conquest of England, and valuable both as an historical source and as a monument of the Norman dialect of French. The *Brut* was edited by Le Roux de Lincy (2 vols., Rouen, 1836–38); the *Roman de Rou*, by F. Pluquet (2 vols., Rouen, 1827), more satisfactorily by H. Andresen (2 vols., Heilbronn, 1877–79). The portion of the latter work relating to the conquest of England was translated into English prose by Edgar Taylor, *Master Wace, his Chronicle of the Norman Conquest* (1837), and by Sir Alexander Malet, *The Conquest of England, from Wace's Poem, now first translated into English Rhyme* (London, 1860). We have also three shorter poems of Wace: *La Conception Notre Dame*, edited by Luzarche (Tours, 1859); *La Vie de Saint Nicolas*, edited by Delius (Bonn, 1850); and *La Vie de Sainte Marguerite*, edited by A. Joly (Paris, 1879). See *Romania*, vol. ix. A. G. CANFIELD.

Wace, HENRY: principal of King's College, London; b. in London, Dec. 10, 1836; was scholar of Brasenose College, Oxford, from which university he received B. A. 1860, M. A.

1873, B. D. 1882, D. D. 1883 (same degree from University of Edinburgh, 1882). He was curate of St. Luke's, Berwick Street, London, 1861–63, and at St. James's, Westminster, 1863–69; lecturer of Grosvenor chapel, South Audley Street, 1870–72; chaplain of Lincoln's Inn 1872–80, and since 1880 has been preacher of Lincoln's Inn. He was Professor of Ecclesiastical History in King's College, London, 1875–83, and has been principal since 1883. He delivered the Boyle lectures for 1874 and 1875 on the subject of *Christianity and Morality*, and in 1879 the Bampton lectures, on *The Foundations of Faith*. He was select preacher at Cambridge 1878 and 1890, and same at Oxford 1880–82; honorary chaplain to the Queen 1884–89, and since 1889 a chaplain in ordinary. Since 1881 he has been a prebendary of St. Paul's. In conjunction with Dr. William Smith, he edited the monumental *Dictionary of Christian Biography, Literature, Sects, and Doctrines, during the first Eight Centuries* (4 vols., 1880–87); with Prof. C. A. Buchheim, *First Principles of the Reformation, or the Ninety-five Theses and the Three Primary Works of Dr. Martin Luther, translated into English* (1883); with Dr. Philip Schaff, the first seven volumes of the second series of the *Select Library of the Nicene and Post-Nicene Fathers of the Christian Church* (1890–94); and alone, *The Bible* (Speaker's) *Commentary on the Apocrypha* (2 vols., 1886). He is also the author of lectures delivered in 1881 at St. James's, Westminster, on *The Gospel and its Witnesses: Some of the Chief Facts in the Life of our Lord, and the Authority of the Evangelical Narratives* (1883); *Some Central Points of our Lord's Ministry* (1890). SAMUEL MACAULEY JACKSON.

Wachu'sett Mountain: a mountain in the northern part of Princeton, Worcester co., Mass.; elevation, 2,018 feet. It is a detached peak, from whose top there is a wide and picturesque view.

Wack'ernagel, JACOB: philologist; b. at Basel, Switzerland, Dec. 11, 1853; studied at Basel, Göttingen, and Leipzig; privat docent, afterward Professor of Greek, in the University of Basel; author of *De pathologiæ veterum initiis* (1876); *Der Ursprung der Brahminismus* (1877); *Das Dehnungsgesetz der griech. Composita* (1889); *Das Studium des klass. Alterthums in der Schweiz* (1891). His work is characterized by great precision in treatment and by the most conscientious regard for the recorded facts of language.

Waco: city (surveyed as a town in 1849, incorporated in 1850); capital of McLennan co., Tex.; at the junction of the Brazos (which divides it) and the Bosque rivers; on the Mo., Kan. and Tex., the St. L. S. W., the San Ant. and Aran. Pass., the Tex. Cent., the Houston and Texas Central, the I. and G. N., and the Waco and Northeastern railways; 43 miles N. W. of Bremond, 95 miles N. E. of Austin (for location, see map of Texas, ref. 3–H). It is the principal interior cotton-market of the State, and received and shipped 210,000 bales in the season of 1900–1901. Since 1889 it has had an abundant supply of artesian water of high medicinal value, there being (1901) 32 flowing wells, each 1,820 to 1,850 feet deep, yielding 500,000 to 1,000,000 gal. daily, and having a pressure of 65 lb.; also a tubular-well system yielding 5,000,000 gal. daily. The water is used for all domestic and public purposes and for manufacturing. The city has 90 miles of water-mains, 35 miles of electric railway, gas and electric plants for lighting and power, and 40 miles of paved and graded streets.

Churches and Schools.—There are 34 church buildings, representing the principal denominations, which cost, with ground, $610,000. The public-school system costs about $95,000 annually, and comprises a central (graduating) building that cost $40,000, and 21 ward schools that cost from $8,000 to $12,000 each. The institutions for higher education are BAYLOR UNIVERSITY (*q. v.*); Add Ran Christian University (Campbellite or Christian, established 1896), cost $70,000, 180 students of both sexes; St. Basil's College for Boys (Roman Catholic, established 1900), with 120 students, cost $60,000; two flourishing business schools; Paul Quinn College (African Methodist Episcopal), for colored youths of both sexes, with about 200 students; and the Academy of the Sacred Heart (Roman Catholic), a boarding-school, with an average of 200 pupils. Both Baylor University and Paul Quinn College have theological departments.

Public Buildings.—There are 5 bridges across the Brazos river here, one a suspension bridge, with 475 feet span, and three of iron for railway traffic. Also a new cantilever wagon bridge, built by county and city (1901), cost $108,000. The city contains a U. S. Government building, county court-house (new, 1901, cost $280,000), and public library.

Finances and Banking.—The municipal receipts and expenditures are each about $380,000 annually; the assessed valuations aggregate $15,000,000; the bonded and floating debt is about $720,000. There are 4 national and 4 private banks, with combined capital of $1,300,000.

Business Interests.—The city has (1901) a retail trade of $30,000,000 and wholesale trade of $8,200,000. There are about 600 mercantile and business firms. The manufactories employ a capital of about $2,000,000 and about 1,500 persons. There are 3 cotton-compresses, 2 cotton-seed oil-mills, 2 roller flour-mills, 3 iron and brass works, woolen-mill, cotton-mill, 2 ice-factories, 2 packing-houses, and numerous minor plants. Pop. (1880) 7,295; (1890) 14,445; (1900) 20,686, with suburbs 28,000.

A. R. MCCOLLUM.

Wadai, waa-daa'ĕe: the most powerful empire of the Central Sudan. It lies S. of the Sahara Desert, Darfur adjoining it on the E. Bargirmi and Kanem on the W. are tributary states. Area about 140,000 sq. miles. This large territory was wrested from its heathen possessors by the Arabs in the seventeenth century. Its conquerors made it a powerful Mohammedan state, and extended its boundaries and influence far beyond their present limits. At the beginning of the nineteenth century the greater part of the Middle and Eastern Sudan was controlled by the Sultan of Wadai. Much of his possessions has since been lost, but Wadai is still the most potent political influence in the Central Sudan. Sultan Ali, who ascended the throne in 1858, is said to be a shrewd and far-sighted ruler, under whose influence the country has made great progress in Arabic civilization and in agriculture. A large part of the country is very fertile, a great number of cattle and horses are raised, and agriculture and iron manufactures are leading industries. Wara was the former capital, but in 1863 the father of Sultan Ali removed the seat of government to Abeshr, ostensibly because evil spirits had rendered the old capital uninhabitable, but really because he desired to live at a greater distance from the most powerful of the ancient nobles of the country. Pop. of Wadai, about 2,600,000; of Abeshr, 15,000. C. C. ADAMS.

Wad'dell, JAMES IREDELL: naval officer; b. at Pittsboro, Chatham co., N. C., July 13, 1824; entered the U. S. navy Sept., 1841; became a passed midshipman in 1847 and a lieutenant in 1855. At the breaking out of the civil war in 1861 he resigned his commission and returned to his native State. He entered the Confederate navy as lieutenant, Mar., 1862; in April was ordered to burn the unfinished ram Mississippi at New Orleans; served as ordnance-officer at Drury's Bluff on James river, Va., where the Federal iron-clad fleet was repulsed; was sent to Europe on special service in 1863, and took charge of the steamer Shenandoah on Oct. 19, 1864, near the island of Madeira. This vessel, originally called the Sea King, had left London on a voyage with British papers, but in the meantime was sold to an agent of the Confederate Government, and turned over to the command of Lieut. Waddell at the time and place stated, where, under her new name, she set out on a cruise against the commerce of the U. S. She first went to Melbourne, Australia, the only port she visited in a cruise of thirteen months. During this cruise she made 38 captures, valued at $1,152,000. She destroyed 32 vessels, and released 6 on bonds. She visited every ocean except the Antarctic. She was the only vessel that carried the Confederate flag around the world, and bore it afloat six months after Lee's surrender. The last gun fired from her deck was on June 22, 1865. Commander Waddell having been informed at sea in Aug., 1865, by the master of the British bark Baracouta, of events in the U. S., desisted from all further belligerent acts, and proceeded to Liverpool with the Shenandoah, where by formal letter to the ministry on Nov. 5, 1865, she was turned over to the British Government, and, soon afterward, by it to the U. S. consul at Liverpool. Commander Waddell, after spending some time in Europe, returned to his native land. He was afterward engaged in the Pacific Mail Steamship Company's service as captain. D. at Annapolis, Md., Mar. 15, 1886.

Wadding, LUKE: ecclesiastic and author; b. at Waterford, Ireland, Oct. 16, 1588; studied theology in the Irish College at Lisbon and elsewhere in Portugal; joined the Franciscan order 1604; became Professor of Divinity at the University of Salamanca; accompanied as chaplain an embassy to Rome in 1618 for the settlement of the controversy relating to the doctrine of the Immaculate Conception, and

wrote the history of the mission in Latin; remained at Rome; founded in 1625 the College of St. Isidore for Irish Franciscans; was one of the papal councilors appointed in the settlement of the Jansenist controversy, in which his own opinions coincided with those of Jansen, but he retracted them upon the publication of the papal bull of condemnation; was procurator of his order at Rome 1630–34, and vice-commissary 1645–48, and refused a cardinal's hat. His works are numerous and voluminous. He edited from the MS. the posthumous *Concordantiæ Bibliorum* of Marius de Calasio (4 vols. folio, 1621) and the works of Duns Scotus (12 vols. in 11, fol., 1639), and wrote the history and bibliography of his order in the elaborate Latin works *Annales Ordinis Minorum* (Lyons, 8 vols. folio, 1625–40; new ed., by J. M. Fonseca, in 22 vols., Rome, 1731–45, continued by Michelesi to 1794) and *Scriptores Ordinis Minorum* (Rome, 1660; new ed. 1806). D. in Rome, Nov. 18, 1657.

Revised by J. J. Keane.

Waddington, William Henry: statesman and author; b. at St.-Remi-sur-l'Avre, in the department of Eure-et-Loire, France, Dec. 11, 1826, of English parentage; graduated at the University of Cambridge 1849; was naturalized in France; spent some time in archæological explorations in Asia Minor and Palestine; became in 1865 a member of the Academy of Inscriptions; was chosen to the National Assembly in 1871; was Minister of Public Instruction under Thiers for a few days in May, 1873, and again held that position under MacMahon in 1876, having in the meanwhile been elected senator. In the new cabinet of Dufaure, Dec. 14, 1877, he became Minister of Foreign Affairs and was the French plenipotentiary at the Congress of Berlin 1878. After the accession of President Grévy he was invited to assume the presidency of the council while still holding the portfolio of Foreign Affairs. His policy aroused vigorous opposition in both the Senate and the Chamber, and on Dec. 27, 1879, he resigned. He was ambassador to the court of St. James 1883–93. D. Jan. 13, 1894. Among his works are *Voyage en Asie mineure au point de vue numismatique* (1850); *Mélanges de Numismatique et de Philologie* (1861); and *Édit de Dioclétien* (1864). He continued the publication of Le Bas's *Voyage archéologique en Grèce et en Asie mineure* (1868–77). Revised by F. M. Colby.

Wade, Benjamin Franklin: statesman; b. near Springfield, Mass., Oct. 27, 1800; worked on a farm during his early manhood, teaching district schools during the winters; removed with his parents to Ashtabula co., O., 1821. He was admitted to the bar in 1827, and was elected prosecuting attorney 1835, to which post he was twice re-elected; State Senator 1837; and president judge of third judicial district 1847. As U. S. Senator 1851–69 he was a firm opponent of slavery, and after Mr. Lincoln's election in 1860, on the question of compromise between the North and the South, he strongly opposed any concessions. The Homestead Bill, which he had for many years advocated, finally passed the Senate in 1862. As chairman of the joint committee on the conduct of the war, he advocated the vigorous prosecution of the war, and favored the confiscation of property in slaves; became president of the Senate *pro tempore* and acting Vice-President of the U. S. on the assassination of President Lincoln; and was one of the commission sent in 1871 to Santo Domingo to report upon the proposed acquisition of that island. D. at Jefferson, O., Mar. 2, 1878. See his *Life*, by Albert G. Riddle (Cleveland, O., 1888).

Wadesboro: town; capital of Anson co., N. C.; on the Atl. Coast Line and the Seaboard Air Line railways; 52 miles E. S. E. of Charlotte, 120 miles S. W. of Raleigh (for location, see map of North Carolina, ref. 4–F). It is in an agricultural region; contains Anson Institute (non-sectarian, opened in 1854), and a national bank (capital $50,000); and has 2 weekly papers. Pop. (1890) 1,198; (1900) 1,546.

Wadi-Halfa (ancient name *Beheni*): a place in Nubia, near the second Nile cataract, at about 22° N. lat. On the west bank of the Nile are two temples, described by Champollion, one bearing the names of Usertasen I. (with a list of conquered tribes), Amenophis II., and Ramses I., and the other dedicated by Thothmes II. and III. to Horus of Beheni. A stele from the twenty-third year of Thothmes III. makes mention of victories over the Phœnicians and other eastern tribes. C. R. G.

Wadsworth: village (settled in 1816, incorporated in 1865); Medina co., O.; on the N. Y., Penn. and Ohio Railroad; 14 miles W. of Akron, 33 miles S. of Cleveland (for location, see map of Ohio, ref. 2–G). It is in an agricultural, coal-mining, and tobacco-growing region; has quarries of sandstone and deposits of salt, fire-clay, and ocher in its vicinity; and has 7 churches, normal school, public-school system of 12 departments, a semi-weekly and a weekly newspaper, and manufactories of steam-injectors, friction-clutch pulleys, flour, carriages and wagons, and door and window screens. Pop. (1880) 1,219; (1890) 1,574; (1900) 1,764.

Editor of "Banner."

Wadsworth, James Samuel: soldier; b. at Genesco, N. Y., Oct. 30, 1807; educated at Hamilton College and at Harvard University; studied law in the office of Daniel Webster; was admitted to the bar, but never practiced law as a profession. Applying himself to agricultural affairs, he was in 1842 elected president of the New York State society. Of Federalist stock, he was a Democrat by conviction, but in the agitation of the slavery question in 1848 he supported the Free-soil party. In 1856 and 1860 he was a Republican presidential elector. On the outbreak of war and interruption of railway communication with the national capital, Wadsworth provisioned two vessels at New York, and accompanied them to Annapolis. At the battle of Bull Run he served as volunteer aide to Gen. McDowell. Commissioned a brigadier-general of volunteers in Aug., 1861, he commanded a brigade in front of Washington until Mar., 1862, when appointed military governor of Washington. While holding this command he received the Republican nomination for Governor of New York, but was defeated by Horatio Seymour. Applying for service in the field, he was assigned to the First Corps in Dec., 1862, participating in the battle of Fredericksburg. At Gettysburg, Wadsworth's division was the first one to engage the enemy on the morning of July 1, 1863, and in the struggle that ensued that day his division lost 2,400 out of 4,000. During the second and third days' fighting he rendered conspicuous service in maintaining the heights on the right of the line. In the Richmond campaign of 1864, Wadsworth commanded the fourth division of the Fifth Corps, which crossed the Rapidan May 5, and was engaged for several hours, sustaining severe loss. In the fighting which was renewed next morning he served with the Second Corps, and while endeavoring to rally his men was struck in the head by a bullet, which caused his death May 8, 1864, two days after being breveted major-general of volunteers.

Wafer [M. Eng. *wafre*, from O. Fr. *waufre*, *gaufre* > Fr. *gaufre*, honeycomb, wafer, from Dutch *wafel*; cf. Germ. *wabe*, honeycomb, and *weben*, weave]: the small circular disk of unleavened bread employed in the celebration of the Eucharist in the Roman Catholic Church. It is usually marked with emblematic figures.

Wager [M. Eng. *wager*, *wajour*, from O. Fr. *wagier*, *wajour* (> Fr. *gageur*), deriv. of *wagier*, *gagier* > Fr. *gager*, pledge, bet, from Teuton. **wadjan*, wager, pledge > Germ. *wetten*]: a promise to pay money or transfer property upon the determination or ascertainment of an uncertain event; the consideration for such a promise is either a present payment or transfer by the other party, or a promise to pay or transfer upon the event determining in a particular way. (Anson, *Law of Contract*, 173.) The early common law treated all wagering contracts as valid. During the eighteenth century, however, the courts became anxious to discountenance those in which the parties had no interest except that which was created by the wager, and were "astute even to an extent bordering on the ridiculous to find reasons for refusing to enforce them." (Parke, B., in *Egerton* vs. *Earl of Brownlow*, 4 House of Lords Cases 124.) Parliament has also declared void some forms of wagering contracts. As a result, wagers in which the parties have no interest are now unenforceable in Great Britain, although they are not illegal. Such has always been the rule in Scotland, the courts declaring that they were instituted to enforce the rights of parties arising from serious transactions, and would pay no regard to sporting agreements. Bell, *Principles of Law*, § 37.

The English common-law view was adopted by the courts in some parts of the U. S., notably in New York, but throughout New England and in most of the States that view was rejected, the courts holding that wagers were inconsistent with the established interests of society, in conflict with the morals of the age, and therefore illegal and void as against public policy. (*Bernard* vs. *Taylor*, 20 Oregon 416.) In accordance with this doctrine it has been decided that a broker who knowingly makes a wagering

contract and pays money for his principal thereon, can not recover it or his commissions from such principal. (*Irvin* vs. *Williar*, 110 U. S. 499.) It follows also from this doctrine that if the losing party notifies the stakeholder not to pay the money to the winner, and it is thereafter paid, the loser may recover it either from the winner who received it or from the stakeholder. *Love* vs. *Howey*, 114 Mass. 80; *Bernard* vs. *Taylor*, *supra*.

Nearly all of the States have statutes declaring void or illegal every species of wager. Occasionally the legislation is very drastic, not only declaring the wager itself illegal, but avoiding all securities given for money lost thereon, even negotiable paper in the hands of a *bona-fide* holder, and permitting the recovery from the stakeholder of money paid to the winner under the loser's directions. (N. Y. Revised Statutes, 8th ed., p. 2218; *Ruckman* vs. *Pitcher*, 1 N. Y. 392.) See BETTING. FRANCIS M. BURDICK.

Wager-policy: in law, an instrument having the form of a policy of insurance, but without any legal interest held by the assured in the subject-matter of the contract or in the risk insured against. It is, therefore, merely a wager, according to the nature of the instrument, between the insurer and the assured, that the contingent event referred to will or will not happen—that the ship will or will not perform her voyage, that the house will or will not burn, or that the person will or will not die, as the case may be. The assured puts at risk or stakes the premium paid, and bets that the uncertain event will take place, while the insurer puts at risk or stakes the sum insured, and bets that such event will not happen. See INSURANCE (*Insurable Interests*). Revised by FRANCIS M. BURDICK.

Wages [from O. Fr. *wage*, *gage*, pledge, guarantee, engagement; cf. Fr. *engager*. These words are from the Teut. **vadjo-*; Goth. *wadi*; Germ. *wette*]: in general, that which is paid for services rendered; in political economy, the share of the workingman in the wealth that his labor has contributed to produce.

Under the title POLITICAL ECONOMY (*q. v.*) the abstract theory of wages is treated briefly. In this place an account is given of the rates of wages at different times in the history of the U. S. Examining wages in this respect, that is, historically, it is found that there has been a persistent tendency upward, although the tendency has been broken here and there by industrial conditions. The rise has been gradual, although there have been long periods when but little, if any, change was noticeable.

Since the earliest colonial days rates of wages have been governed by economic laws and the conditions of business, but in those days attempts were made at frequent intervals to establish wage-rates by legislative action. Following the custom of the old country as it had prevailed at different periods, the Massachusetts Bay Colony, as early as 1633, by the action of the general court, made it a rule that carpenters, sawyers, masons, bricklayers, tilers, joiners, wheelwrights, mowers, and other master-workmen should not receive more than 2*s.* a day, the workman to pay his own board, but should he elect to board with his employer, then he was to receive 14*d.* a day. The rates of pay of inferior workmen in the occupations named were fixed by the constable. Skilled tailors were paid 12*d.* a day, and the poorer ones were paid 8*d.* with their living. The time of labor included the whole day, allowances being made for food and rest. An employer paying wages beyond the amounts established by law and a workman receiving extra wages were subjected to penalties. Idleness, even, was the subject of punishment. Such legislation, varying in quality and terms, continued for some years, one statute following another in the attempt to regulate the rates of wages, and the regulation applied first to one side and then to the other; that is, an employer was punishable if he paid too high a wage and an employee was punishable if he demanded a higher wage than that paid by law.

It is quite difficult to state with any definiteness the average wages paid to any class, but it is certain that for a long period after the settlement of the colonies 2*s.* a day was a fair average for mechanical labor, the variation from this depending much upon legislation, for the annoying regulations continued through the seventeenth century, even prohibiting excessive prices by dealers in order to regulate wages. At the close of the seventeenth century, however, common laborers were paid 2*s.* a day, the same as they had been paid forty years before. Women, when they went out to service, received from £4 to £5 a year. After the seventeenth century laborers were paid 3*s.* and sometimes as much as 4*s.* a day.

It is somewhat strange that wages remained as steady as they did during the whole of the seventeenth century, no great change coming until far into the eighteenth century, when the compensation of farm-laborers was very generally taken as the standard for wages paid to mechanics and tradesmen. When the colonial period closed, laborers on farms were paid about 40 cents a day, butchers only 33⅓ cents a day, carpenters 52 cents, ship and boat builders about 90 cents, shoemakers 73 cents, and blacksmiths only 70 cents. These illustrations are quite sufficient to show the general rates of wages during and at the close of the colonial period. Of course the value of a day's wage then, as now, should be estimated by its purchasing power, instead of by its nominal rate. To state with reasonable accuracy the purchasing power of money during the seventeenth century is a more difficult matter than to give the rates of wages. Quality can not be compared with quality, while the great variation in the price of an article on account of conditions and locality distorts any comparison even when quality can be ascertained. There was no market price. Wheat might bring 5*s.* per bushel in one place and at another point near by it might be sold at 10*s.* Taking the fairest possible quotations for the closing years of the seventeenth century and for 1890 for New England, covering some leading articles of consumption, some reasonably honest comparisons can be made. For instance, a dollar present money would have purchased a bushel of winter wheat or a gallon of common molasses or a bushel of barley at both periods, while of corn 1⅓ bush. could have been purchased in 1698 and 3 bush. in 1890; a dollar represented a bushel of rye in 1694 and nearly 2 bush. in the later period. A common grade of wheat flour brought about $16 per barrel in 1697 and $6 in 1890. Butter, cheese, and meats generally were considerably lower than now, butter selling for from 8 cents to 14 cents per pound, and meats for from 10 cents to 20 cents. Sugar, tea, and coffee, on the other hand, were very dear all through the earlier period, tea selling for from $5 to $10 per pound, while a good article could be obtained for 50 cents per pound in 1890. In the absence of price-lists for a large number of articles, classified according to importance in consumption, but using such fugitive material as exists, the conclusion must be reached that a dollar will purchase now a much larger quantity of the necessaries of life than during the last quarter of the seventeenth century, although the commonest things, those which nearly every family produced for home consumption, were quite low during the earlier period. An exceedingly limited market existed for any small surplus of products. Real wages, wages measured by purchasing power, were much lower than at present. It is to be regretted that many elements essential to fairly exact comparison are often lacking. The citations given, however, are representative of general conditions and show the upward tendency of wages.

Soon after the colonial period closed industry revived, and the factory system was established, and it may safely be stated that American industries were securely planted, so that from that time on there has been a very constant upward tendency in wages in all directions. The earlier part of this period, that following the establishment of the factory system, showed fair advance. Carpenters in 1790 were paid less than 60 cents a day; in 1800, over 70 cents; in 1810, $1.09 on the average; in 1820, $1.13; in 1830 about the same, although in the northern parts of the U. S. $1.40 a day was the average for carpenters during the years from 1830 to 1840. There was not much change in this class of labor until 1860, since which date the average for carpenters has been raised constantly, until in 1880 it reached $2.42, and now very often carpenters receive $3.50 a day.

If we turn to laborers as in a fair way representing general conditions, the facts at command show that they received about 43 cents a day in 1790, 62½ cents in 1800, while from 1800 to 1810 their average pay in the Northern States was 82 cents a day. This was increased to 90 cents during the next decade, although from 1840 to 1860 the pay of common laborers varied from 87½ cents to $1 a day. They receive from $1.50 to $2 a day at the present time.

Cotton-mill operatives, a class not much known in the U. S. until about 1820, received from that year until 1830 44 cents a day, on the average, while just prior to 1840 their pay was increased to 90 cents, and during the next decade their average pay was $1.03 a day. The compensation of woolen-mill operatives was somewhat higher, for in the

early part of the factory period, that is, during the years just prior to 1830, they were paid a daily wage of $1.12, but this was rarely reached again before 1880. In the latter year agricultural laborers were paid $1.31, blacksmiths $2.28, masons $2.79, and shoemakers $1.76. A general average wage for operatives, however, is misleading, and representative classes are better for a general conclusion; so specific rates have been given.

Carrying this comparison of actual wages for distinct classes into the building trades, it is found that a representative establishment in New York reports the pay for carpenters in 1840 at $1.50 a day, and in 1891 at $3.50 a day, while the hours of work were reduced from ten to eight. The pay of bricklayers and their helpers rose from $1.75 and $1 respectively in 1851 to $4 and $2.50 respectively in 1891, while the working time was decreased two hours. Railway employees experienced the same increase, locomotive engineers and firemen moving from $2.14 and $1 respectively in 1840 to $3.77 and $1.96 respectively in 1891. Passenger-car conductors had their average pay raised from $2.11 to $3.84 a day. These examples are taken from actual pay-rolls.

The great commercial convulsions of 1837 and 1857 caused a depression in wage-rates, and they did not fully recover prior to 1860; yet the averages for the decade from 1850 to 1860 were a very decided advance over those for the decade ending in 1830. The civil war caused great fluctuations in currency, while the financial crisis of 1873 had a powerful influence on wages, so that there were many changes. It is therefore better in these days to compare the averages for 1860 with those for 1880 and 1890. All these averages, wherever made, indicate a general increase in wages in all occupations during the fifty years from 1830 to 1880. Using the statements taken from actual pay-rolls and as made by the Senate committee on finance in its report on *Wholesale Prices, Wages, and Transportation* (Senate Report No. 1394, Fifty-second Congress, second session), one is able to make a general comparison of wages without much reference to occupations. This comparison, as made by the committee, is a most excellent one, and indicates the general course of wages better than any other statement yet made. The method was to put all wages that were paid in 1860 at 100. Starting from such a basis it was found that, taking the wages in 22 industries and comprehending about 100 distinct establishments, and reducing all the facts to simple averages, wages stood at 87·7 per cent. in 1840 as compared with 100 in 1860; in 1866 they stood at 152·4, and in 1891 at 160·7; that is to say, as compared with 1860 wages in 22 industries showed an increase of 60·7 per cent. in 1891, and as compared with 1840 wages were 73 per cent. higher in 1891. To be more correct, however, the rates should be taken in accordance with the importance of each industry relative to all industries. Taking 1860 as represented by 100 again, as in the former case, the general average of wages in 1840, on the basis of the importance of each industry as compared to all, is represented by 82·5 per cent., in 1866 by 155·6, and in 1891 by 168·6, there being some variation in the two methods. On the latter basis wages have increased 68·6 per cent. since 1860 and 86·1 per cent. since 1840. These two percentages, then—73 and 86·1—come into comparison. Probably the mean is more just, and thus it is fair to say that wages in the leading industries of the country are 80 per cent., at least, higher than they were in 1840. Very many wages are double what they were at that date. It is true that with this increase there has been, in every direction, a decrease in the working time of each day and a general decrease in the cost of living, taking all articles into consideration. The decrease in cost of living, however, has not been equal to the increase in wages. Rents are much higher, and so are meats and some other articles; but taking the wholesale prices of two hundred and twenty-three of the leading articles of consumption, it is found that there has been a decrease since 1860 of about 6 per cent. The general conclusion, therefore, is quite positive and absolute that, while the percentage of increase in prices may have risen at different periods, say in 1866 and along for ten years, far beyond the increase in wages, they had by 1891 fallen to a point lower, on the whole, than they were in 1840, and certainly 6 per cent. lower than in 1860, while wages had risen to a point even much above what they reached in the inflation period of 1866.

What is true of the U. S. is true of other countries engaged in mechanical industries as allied to agriculture. In Great Britain the increase in wages since about 1850, starting from a lower point, however, has quite kept pace, relatively, with the increase in the U. S., whether taken on the basis of nominal wages—that is, the simple rates paid—or upon real wages—that is, the consuming power as governed by the prices of commodities.

For a general study of the rates of wages attention should be given to *Six Centuries of Work and Wages*, by J. E. Thorold Rogers, M. P.; the statistical statements of Dr. Robert Giffen, of the British Board of Trade; the reports of the British Department of Labor; the facts to be found in the *Historical Review of Wages and Prices, 1752–1860*, published by the Massachusetts bureau of statistics of labor; the report of the Senate committee on finance already referred to; and a work by the author entitled *The Industrial Evolution of the United States* (Meadville, Pa., 1895). For very full statements as to the wages in colonial days, given in more detail than in any other of the American works referred to, reference is made to Weeden's *Economic and Social History of New England, 1620–1789* (2 vols., Boston and New York, 1890). CARROLL D. WRIGHT.

Wagner, RUDOLF, M. D.: physiologist; b. at Baireuth, Bavaria, July 30, 1805; studied medicine at Erlangen and Würzburg, and comparative anatomy in Paris under Cuvier; was appointed Professor of Zoölogy at the University of Erlangen in 1833, and in 1840 at the University of Göttingen, where he died May 13, 1864. His principal works are *Lehrbuch der vergleichenden Anatomie* (2 vols., Leipzig, 1834–35); *Icones physiologicæ* (Leipzig, 1839); *Lehrbuch der Physiologie* (Leipzig, 1839); *Handwörterbuch der Physiologie* (4 vols., Brunswick, 1842–53); *Neurologische Untersuchungen* (Göttingen, 1854); *Vorstudien zu einer wissenschaftlichen Morphologie und Physiologie des menschlichen Gehirns als Seelenorgans* (2 vols., Göttingen, 1860–62).—His younger brother, MORITZ FRIEDRICH WAGNER, b. at Baireuth, Oct. 3, 1813, studied natural science at Erlangen and Munich; accompanied the French army in Algeria 1837–38 as a member of the scientific commission; studied geology at Göttingen; was appointed professor at the University of Munich in 1860. Author of *Reisen in der Regentschaft Algier* (3 vols., Leipzig, 1840); *Der Kaukasus und das Land der Kosacken* (2 vols., Leipzig, 1848); *Reise nach dem Ararat und dem Hochlande Armeniens* (Stüttgart, 1848); *Reise nach Kolchis* (Leipzig, 1850); *Reise nach Persien und dem Lande der Kurden* (2 vols., Leipzig, 1852); *Reisen in Nordamerika* (with Scherzer, 3 vols., Leipzig, 1854); *Die Republik Costarica* (Leipzig, 1856); *Naturwissenschaftliche Reisen im tropischen Amerika* (1870); *Die Entstehung der Arten durch räumliche Sonderung* (1889). His *Travels in Persia, Georgia, and Koordistan* was translated into English in 3 vols. (London, 1854). D. in Munich, May 31, 1887.

Wagner, SIEGFRIED: See the Appendix.

Wagner, WILHELM RICHARD: composer; b. in Leipzig, Germany, May 22, 1813; d. in Venice, Italy, Feb. 13, 1883. His father, who was a police actuary, died six months after Richard's birth. His mother married an actor and painter, and the family removed to Dresden. Richard's stepfather wished to make a painter of him, but he showed no aptitude for the painter's art. The boy played tunes on the piano at the age of seven; at nine he entered the Dresden Kreutzschule, and studied hard—not music, which he cared little for, but Greek, Latin, ancient history, and mythology. He made verses, longed to be a poet, translated twelve books of the *Odyssey*, took up English, and in his enthusiasm for Shakspeare projected a tragedy which was a compound of *Hamlet* and *Lear*. His passion for music was awakened by hearing Beethoven's music in Leipzig; he studied then in order to adapt his great tragedy for the lyric stage, but in a desultory and fitful way, which resulted in no solid attainment. He had no systematic instruction until his sixteenth year, and then his impetuous genius disdained rules; he preferred composing music to studying it. One of his boyish overtures was played in the Leipzig theater. Less than six months with Theodor Weinlig, spent in the study of counterpoint, was his first equipment for his extraordinary career. He was then nineteen. An overture composed at this time, after the model of Beethoven, was played and well received, he tells us, at one of the Gewandhaus concerts; a symphony, composed after Beethoven and Mozart, was performed at the Conservatory in Vienna, and later at the Gewandhaus in Leipzig. At this period Wagner visited Vienna, Prague, Würzburg, making the acquaintance of music and musicians, all the while undergoing the intellectual preparation which introduced his musical reform. At twenty-one he abandoned Beethoven as an operatic model, and felt that a

new era in music was about to dawn. In 1834 he accepted the place of musical director at the theater of Magdeburg; completed and on ten days' notice presented an opera, *Das Liebesverbot*, and was not disheartened by its failure; went to Berlin with *Das Liebesverbot*, but met with no practical encouragement at the royal opera; asked for and received the position of musical director at Königsberg; in Dresden was moved by reading Bulwer's *Rienzi* to write an opera with that title, which, after some delay, was brought out in Dresden in 1842; visited London, and, being driven by a storm into a Norwegian port, caught the legend of *The Flying Dutchman*; went to Paris, but found no welcome; in 1839–40 composed an overture to the first part of Goethe's *Faust* and several songs; suffered from want to the degree that he was compelled to arrange music for all sorts of instruments. In 1842 the success of *Rienzi* at Dresden secured his appointment to the post of Kapellmeister at the Dresden opera-house. Here he finished *The Flying Dutchman*, and composed *Tannhäuser*. In 1849 his revolutionary enthusiasm forced him to take refuge in Zurich. There he became director of the musical society and of the orchestra of the theater; composed *Lohengrin*, and began the composition of the *Nibelungen*; in 1858 left Zurich, and resided for short periods in Italy, Paris, Vienna, Carlsruhe; attracted the attention of Ludwig II., King of Bavaria; established himself in Munich, and entered on his fame. *Tristan und Isolde* appeared in 1865; *Die Meistersinger von Nürnberg* in 1868, and *Rheingold*, the prelude to the *Nibelungen*, in 1869. At Munich was laid the plan so brilliantly carried out at Baireuth in the summer of 1876, where in a theater of his own design, with an orchestra composed of the best material Germany could furnish, and singers he had himself selected, was produced, under royal patronage and imperial countenance, with the moral and financial support of a large and distinguished public, the famous opera of the *Nibelungen Ring*, in which his musical theories first found full expression. Wagner's musical reform is not technical; it embraces the whole field of conception and expression. Disgusted with the Italian and French school of opera, while persuaded more and more that opera was the highest form of musical expression, loathing the silly *libretti* and disdaining the practice of making music subservient to the convenience of pet singers, he contended that the theme of opera should be poetic in the purest, deepest sense; that the poetry should be joined with fitting music, vocal and instrumental; and that the whole should be associated with the convictions and sympathies of humanity. Hence he took his themes from romance, legend, and popular myths, and in his musical adaptations consulted the intellectual demands of his theme, neglecting and even scorning the popular types of song and melody. Wagner was always his own librettist, and the text of his musical works has a very considerable poetic value. His many prose writings (collected in nine volumes) show that he would have made his mark as a philosophical and polemical essayist, had not music itself supervened. *The Flying Dutchman*, *Tannhäuser*, and *Lohengrin* were composed and performed prior to the works in which he more fully developed his art theories. These latter comprise the *Meistersinger*, *Tristan und Isolde* (1865), the *Nibelungen Ring*, and *Parsifal* (1882). The *Nibelungen Ring* is the collective name for four large works, each requiring an evening's performance, beginning with *Rheingold* as general preface to the story and followed successively by the *Walkyrie*, *Siegfried*, and the *Götterdämmerung* (Dusk of the Gods). Even prior to the performance of these colossal works Wagner had himself declared that *Tristan und Isolde* illustrated his theories fully, and by it he was willing to be judged. Here he said, "I moved with entire freedom and disregard of all theoretic scruples." Wagner resented the charge that his music is destitute of melody. "The one true form of music," he said, "is melody. Music that has no melody has no inspiration, no power over the feelings, no originality. But melody is something more than the fixed and narrow form that belongs to the childish stage of musical art—the dance form." "The wanderer in the wood becomes every moment more distinctly aware of endlessly varied voices that are audible in the forest. They grow louder and louder, and the voices, the separate tunes, he hears are so many that the whole music seems to him one grand forest melody. Yet he can not hum it over to himself; and to hear it again he must again go to the woods."

Wagner is without doubt the greatest musical genius that has arisen since Beethoven. He is the acknowledged master of orchestration and of dramatic construction for the stage. In music he was a revolutionist and reformer. Like other reformers in other spheres than music he may have been too radical in certain directions, but the influence of his declared and marvelously exemplified principles will very largely affect the dramatic composition of the future. See, further, besides his own writings, *R. Wagner*, by F. Hueffer (London, 1874); *The Nibelungen Trilogie*, by G. Kobbé (New York); an exhaustive review by E. Dannreuther in Grove's *Dictionary of Music and Musicians*, with complete list of Wagner's compositions; and the best and most unbiased work, *Richard Wagner: his Life and Works*, from the French of Adolphe Jullien (Boston, 1892).

Revised by DUDLEY BUCK.

Wagons: See CARRIAGES.

Wagram, *vaa'graam*: a village of Lower Austria; 12 miles N. E. of Vienna (see map of Austria-Hungary, ref. 5–F); famous for the victory which Napoleon gained here over the Austrians under the Archduke Charles July 6, 1809. After his severe repulse at Aspern (May 21–22) Napoleon retreated to the island of Lobau, which he fortified. On the night of July 4, having hastily thrown bridges over to the northern bank of the Danube, he marched toward the Austrian position with a force of about 180,000 men, and on the evening of the 5th ordered an attack on the enemy's center. The Austrians, numbering about 120,000, drove back the French, inflicting heavy losses, and on the morning of the 6th themselves assumed the offensive. Their right wing carried all before it, but their left was outflanked by the French. At this juncture Napoleon gathered all his available forces for an attack on the Austrian center, which the Archduke Charles had weakened in order to add to the strength of the wings. The French broke through the line and gained the day, but the Austrians retreated in good order. The loss in killed and wounded was about 24,000 on each side. It was one of the most hotly contested battles of the Napoleonic wars, and, had the Archduke John with his 30,000 men re-enforced the Austrians, as was expected, the issue of the battle might have been different. An armistice was concluded at Znaim on July 12, and this was followed by the peace of Vienna Oct. 14, 1809.

F. M. COLBY.

Wagtail: any bird of the passerine genera *Motacilla* and *Budytes*. The wagtails have the bill slender and conical, with the upper mandible slightly notched at the tip; have long and pointed wings, each with nine primaries; the tail is slightly rounded, longer than, or equal to, the wings; the feathers are mostly broadest at the middle, and thence taper to the tips. The name is given in allusion to their habit of "wagging" their tail in a fan-like manner. They are active birds, at home equally in the air and on land; they fly by short undulating courses, and frequently emit, while on the wing, chirping notes; on the ground they run by a rapid succession of steps. The species are quite numerous, and naturally peculiar to the Old World and Australia, but *Motacilla alba* and *Budytes flava* stray into North America.

F. A. L.

Wah: See AILURUS.

Waha'bees, or **Wahabites**: a Mussulman sect founded about 1750 by Abd-el Wahab, an Arabian reformer. He taught no new doctrine, but strove to restore Islam to its original simplicity and austerity. He denounced as superstitious the veneration paid to the memory of the prophet and to relics and tombs esteemed holy, taught total abstinence from tobacco as well as from wine and opium, and demanded purity and frugality in life. He did not interfere in politics. Preaching was his principal weapon. Soud, Sultan of Nedjed, speedily espoused the cause of the reform. From his capital, Derayah, it spread rapidly, and before the death of Wahab (1787) was accepted by the larger part of the peninsula. To Soud, as to his successors, Abd-ul Aziz and Soud II., the reform was a political engine which they employed with success to subdue their neighbors and to unite Arabia under their sway. Mecca (1803) and Medina (1804) were captured, and Bagdad was threatened. All pilgrimages were stopped. Thereupon the Ottoman sultan, Selim III., ordered his vassal MEHEMET ALI PASHA (*q. v.*) to chastise Soud. Seven years were spent in preparation. Meanwhile Napoleon, who had not abandoned his scheme of uniting the Arabs in a grand expedition against the British in India, was negotiating with the Wahabees. They entertained his proposals favorably, but the ruinous Russian campaign (1812) intervened. Mecca and Medina were captured (1812) by Toussoun Pasha, son of Mehemet

Ali. Derayah was destroyed (1818) by Ibrahim Pasha, another son of Mehemet Ali, and Abdullah II. surrendered. He was sent to Constantinople, and beheaded in front of St. Sophia. The Wahabees seemed crushed. Nevertheless they speedily expelled their Egyptian governors, and in 1849 all attempts to subdue them were definitely abandoned. They have since remained undisturbed, and dominate the Nedjed. They probably number 1,500,000. They are accounted heretics. This is due rather to their political actions than to their doctrines, as they differ in few respects from the most orthodox Moslems. They are the Puritans of Islam. See Corancez, *Histoire des Wahabites depuis leur origine jusqu'à l'an 1809* (Paris, 1810); Palgrave, *Narration of a Year's Journey through Central and Eastern Arabia* (London, 1865); Burckhardt, *Notes on the Bedouins and the Wahabys* (London, 1830); Sedillot, *Histoire des Arabes* (Paris, 1850). EDWIN A. GROSVENOR.

Wahehe: another spelling of UHEHE (*q. v.*).

Wahoo' [Amer. Ind.]: (1) the *Euonymus atropurpureus*, a fine ornamental shrub of the U. S. belonging to the family *Sapindaceæ*, and often called burning bush and spindle-tree. Its bark has considerable use in medicine as a diuretic, tonic, and alterative, with cathartic powers. (2) The winged elm, *Utmus alata*, a small tree of the Southern U. S. Its wood is much valued for timber. Its branches have singular corky wings.

Wahoo: city; capital of Saunders co., Neb.: on the Cottonwood creek, and the Burl. Route, the Fre., Elk and Mo. Val., and the Union Pac. railways; 18 miles S. S. W. of Frémont, 50 miles W. of Omaha (for location, see map of Nebraska, ref. 10–G). It is in an agricultural and stock-raising region, and has 11 churches, 2 public-school buildings, Luther Academy (Evangelical Lutheran, chartered in 1883), 2 national banks with combined capital of $180,000, a private bank, and 4 weekly newspapers. Pop. (1880) 1,064; (1890) 2,006; (1900) 2,100. EDITOR OF "WASP."

Wah'peton: city (founded in 1875, incorporated as a village in 1881, as a city in 1884); capital of Richland co., N. D.; at the junction of the Red River of the North and the Sioux Wood river; on the Chi., Mil., and St. P., the Great North., and the N. Pac. railways; opposite Breckenridge, Minn., 45 miles S. of Fargo (for location, see map of North Dakota, ref. 4–F). It has 8 church organizations, the Red River Valley University (Methodist Episcopal), public-school system of 6 departments, parochial school of 4 departments, county court-house, water-works system (cost $85,000), electric lights, and 3 weekly newspapers. It is principally engaged in shipping agricultural produce, and has large flour-mills, grain elevators, and grain warehouses. Pop. (1880) 400; (1890) 1,510; (1900) 2,228.
EDITOR OF "GAZETTE."

Waiblingen, *vī'bling-en*: town of the kingdom of Würtemberg, in the circle of the Neckar, on the Rhems; 2 miles N. E. from Stuttgart, in an exceedingly fertile region (see map of German Empire, ref. 7–D). It is a central station on the Würtemberg state railways, and has tanneries, manufactures of silk, wool, and linen, and four large factories of bricks and pottery. The town, originally a settlement on the Roman high-road to Germany, was an imperial palace (*Pfatz*) under the Carlovingians, passed to the Salian emperors, who took from it the name of Waiblinger, and then to the house of Hohenstaufen. Their name of Waiblinger became Italianized into *Ghibellines* as the designation of the Hohenstaufen party against the Guelphs. Pop. (1890) 4,786. H. S.

Waice: See WACE.

Waihu Island: See EASTER ISLAND.

Waiilatpu'an Indians [*Waiilatpuan* is from *Wayi'let-pu*, the plural of *Wa-i'tet*, one Cayuse man]: a linguistic family of North American Indians established by Hale, who placed under it the Cailloux (or Cayuse or Willetpoos), and the Molele (or Molale).

The Cayuse occupied the region between Des Chutes river and the Blue Mountains, Ore., adjoining the Nez Percé and Walla Walla Indians. According to Maj. Alvord, in 1853 they resided chiefly on Umatilla river, claiming a large area from Willow creek (in Morrow County) on the S. W. to the Blue Mountains and including the Grande Ronde, and northward to within 15 miles of Fort Walla Walla. According to the census of 1890, there were 415 Cayuse Indians on the Umatilla reservation, although these speak the Umatilla language instead of their own.

The Molele form the western division of this family. They were originally an offshoot of the Cayuse, and, as the latter state, lived with them in their country S. of the Columbia. In 1853, according to Maj. Alvord, there were many Molele on the upper Des Chutes river, wanderers from the body of the tribe, whose proper haunts were W. of the Cascade Mountains. The Molele appear to have been essentially mountain Indians, and to have lived in the Cascade Mountains, Oregon, at various points between Mts. Hood and Scott (the latter in Klamath County). They appear never to have been numerous, and at present are almost extinct. Their common name is derived from a creek in Clackamas County, Ore., S. of Oregon city, and was applied to a band of these Indians who dispossessed the original occupants. Subsequently the name was extended to the various bands. In 1889 there were thirty-one Molele on Grande Ronde reservation, Ore., and a few in the mountains W. of Klamath Lake.

Both the Cayuse and Molele appear to have been brave and warlike, and to their frequent warfare was probably due their small and, during historical times, constantly decreasing numbers. The Cayuse were frequently at war with the Blackfeet, and used to levy tribute on the Dalles Indians, claiming the fishery. They were intimately associated with the Nez Percé and Walla Walla, with whom they have so often intermarried that they have become practically extinct as a tribe. See INDIANS OF NORTH AMERICA.
JAMES OWEN DORSEY.

Wainwright, JONATHAN MAYHEW, D. D., D. C. L.: bishop and author; b. in Liverpool, England, Feb. 24, 1792, of American parents, his mother being a daughter of Rev. Dr. Jonathan Mayhew, of Boston; went with his parents to the U. S. 1803; graduated at Harvard 1812; was tutor there in rhetoric and oratory 1815–17; took orders in the Protestant Episcopal Church 1816; became rector of Christ church, Hartford, Conn., 1816; assistant minister of Trinity church, New York, 1819; rector of Grace church, New York, 1821, of Trinity church, Boston, Mass., 1834, and again assistant minister of Trinity church, New York, 1838, having especial charge of St. John's chapel: visited Europe and the East 1848–49, and Europe again in 1852, when the University of Oxford conferred upon him the doctorate of civil and canon law; he received the doctorate in divinity from Union College in 1823, and from his *alma mater* (Harvard) in 1835; was many years secretary to the House of Bishops; was chosen provisional bishop of New York in October, and consecrated Nov. 10, 1852; was a fine musician, and an admired pulpit orator. D. in New York city, Sept. 21, 1854. He published a *Book of Chants* (1819); *Music of the Church* (1828); *The Pathways and Abiding-places of our Lord* (illustrated, 1851); *The Land of Bondage, a Journal of a Tour in Egypt* (1852); several liturgical compilations; and, with Dr. W. A. Muhlenberg, *The Choir and Famity Psalter* (1851). He edited Bishop Ravenscroft's *Memoir*, the *Life of Bishop Heber, by his Widow* (1830), and *Our Saviour with Prophets and Apostles* (1850). A controversy between him and Rev. Dr. Potts on the possibility of "a Church without a bishop" was issued in a volume in 1844. A *Memoriat Volume* of his sermons appeared in 1856, with a memoir by Bishop Doane; and another *Life* was prepared by Rev. John N. Norton, and published in New York in 1858.

Wait, WILLIAM: law-writer; b. at Ephratah, N. Y., Feb. 2, 1821; studied law, and was admitted to the bar in 1846; was district attorney in 1848; took up the compilation and publishing of law-books, for which he was especially adapted by his accuracy and thoroughness. D. at Johnstown, N. Y., Dec. 29, 1880. Besides other works, he published *The Code of Civil Procedure of the State of New York*; *Law and Practice in Civit Actions and Proceedings in Justices' Courts and on Appeals to County Courts in the State of New York*; *Practice at Law, in Equity, and in Special Proceedings in all the Courts of Record in the State of New York*; *Treatise upon some of the General Principles of the Law, whether of a Legal or an Equitable Nature, including their relations and applications to Actions and Defenses in Generat.* F. STURGES ALLEN.

Waite, Mrs. CATHARINE: See the Appendix.

Waite, HENRY RANDALL: See the Appendix.

Waite, MORRISON REMICK, LL. D.: jurist; b. at Lyme, Conn., Nov. 29, 1816; attended Bacon Academy at Colchester, Conn., and graduated at Yale College in 1837; took up the practice of law with his father, but in 1838 removed to

Maumee City, O., where he entered the law office of Samuel M. Young, and, being admitted to the bar in the following year, entered into partnership with Mr. Young; in 1850 removed with Mr. Young to Toledo, and later entered into partnership with his younger brother, continuing the partnership until made chief justice in 1874. He soon became the acknowledged leader of the Ohio bar, and declined a seat on the Supreme Court bench of that State; in 1849 was elected to the Ohio Legislature, and held some other public positions, but refused to sacrifice his legal work to take an active part in politics. He gained a national reputation as one of the counsel for the U. S., together with William M. Evarts, in the arbitration on the Alabama claims in Geneva, Switzerland, 1871–72; in 1873 was president of the Ohio constitutional convention; in 1874 was nominated and unanimously confirmed to fill the vacancy in the Supreme Court created by the death of Chief Justice Chase; in 1876 declined to allow his name to be used as a candidate for President of the U. S. In his position as chief justice of the Supreme Court of the U. S. he wrote many of the most important decisions of the court, among which are those on the head-money tax cases (1876), the election laws (1880), the power of removal of the President (1881), the Civil Rights Act (1883), the Alabama claims and the Legal Tender Act (1885), the express companies and extradition cases (1886), the Virginia debt cases and the affair of the Chicago anarchists (1887). He was a firm believer in the doctrine of State rights. In politics he was a Whig until the disbandment of the Whig party, and from that time he was a Republican; but in his decisions he was never influenced by political considerations or fear of public opinion. He was remarkable not so much for brilliancy and extraordinary learning as for administrative ability and for persistent attention to all the details and intricacies of any case in hand; and in administering the affairs of the court he rigidly enforced the rules of practice. In private life he was very unassuming and of a genial disposition. D. in Washington, D. C., Mar. 23, 1888. F. STURGES ALLEN.

Waits [M. Eng. *waite*, *wayte*, from O. Fr. *waite*, *gaite*, watchman, guard, from O. H. Germ. *wahta* > Germ. *wacht*, guard, watch]: a class of watchmen in English and Scotch towns who formerly at certain fixed hours of the night played upon the pipe and other instruments. In London and many other places the waits were officially recognized until toward the middle of the nineteenth century, and even later in some places. In London there are still companies of men called waits who, during the Advent season, frequently serenade the citizens, and on Christmas morning call for a Christmas-box.

Waitz, GEORG: historian; b. at Flensburg, Schleswig, Oct. 9, 1813; studied law and history at the Universities of Kiel and Berlin; visited numerous cities in Germany, France, and Scandinavia, investigating their archives; was appointed Professor of History at Kiel in 1842, at Göttingen in 1849, and removed in 1875 to Berlin, as editor of the *Monumenta Germaniæ Historica*. His principal works are *Deutsche Verfassungsgeschichte* (4 vols., 1843–61): *Die Schleswig-holsteinische Geschichte* (2 vols., 1851–54); *Lübeck unter Jürgen Wullenweber* (3 vols., 1855–56); *Grundzüge der Politik* (1862); besides numerous minor essays, monographs, and editions of documents relating to the history of Germany. As an historian he is a pupil of Leopold von Ranke. As a practical politician he belonged to the school of Gagern, and in 1849 he attended as a delegate the diet that met in Frankfort-on-the-Main, but, together with his master, resigned from that body. D. at Berlin, May 24, 1886. Revised by J. GOEBEL.

Waitz, THEODOR: psychologist and anthropologist; b. at Gotha, Germany, Mar. 17, 1821; studied at Leipzig and Jena; traveled in 1842–43 in France and Italy; published in 1844–46 a critical edition of Aristotle's *Organon* (in 2 vols.), and was appointed in 1848 Professor of Philosophy at the University of Marburg, where he died May 21, 1864. He wrote *Grundlegung der Psychologie* (Hamburg, 1846; 2d ed. 1878); *Lehrbuch der Psychologie als Naturwissenschaft* (Brunswick, 1849); *Allgemeine Pädagogik* (Brunswick, 1852; 3d ed. 1882); and *Die Anthropologie der Naturvölker* (6 vols., Leipzig, 1859–71; 5th and 6th edited by Gerland). Revised by J. M. BALDWIN.

Waitzen, or **Waizen**, vīt'sen (Hung. *Vácz*): town; in the Hungarian county of Pesth-Pilis-Solt; on the left bank of the Danube, 20 miles by rail N. of Pesth (see map of Austria-Hungary, ref. 5–H). It has been a Roman Catholic bishopric since 1075, has many Roman and mediæval monuments, several educational and charitable institutions, and a large trade in cattle and wine. Pop. 13,190. H. S.

Waiver [from O. Fr. *eveyver*, *guesver*, waive, refuse, abandon; cf. Eng. *waif*, orig., goods abandoned by a thief in flight]: the voluntary relinquishment of a private right. The right may be conferred by a constitutional or a statutory provision, or by a common-law rule, or it may originate in a contract. In either case it may be waived, provided it is a private right. If, however, the right involves a matter of public morals or policy it can not be waived. Hence the defendant in a criminal case can not waive a trial by a common-law jury in a jurisdiction where trial by jury is guaranteed by a constitutional provision. (*In re Staff*, 63 Wis. 285.) But the right to have judicial proceedings in a civil action conducted in a prescribed manner may be waived by becoming a party to such proceedings without seasonably objecting to the irregularities. So the right to have a statute declared unconstitutional may be waived by accepting the benefits of legislation based upon its assumed validity. *Mayor* vs. *Manhattan Railway*, 143 N. Y. 1.

If the right originates in a contract it can be waived only by an agreement of the parties based on a consideration, or by acts of the possessor of the right operating by way of ESTOPPEL (*q. v.*). Such is the general rule. If the right in question, however, is that of forfeiture—for example, the forfeiture of an insurance policy by the non-payment of a premium—there is considerable authority for the view that the waiver of it need not be based on a contract or an estoppel. If in any negotiations or transactions with the insured, after knowledge of the forfeiture, the insurer recognizes the continued validity of the policy, or does acts based thereon, the forfeiture is as a matter of law waived. (*Titus* vs. *Glens Falls Ins. Co.*, 81 N. Y. 410.) In Great Britain another exception to the rule exists in the case of negotiable paper. The holder of such paper may waive his rights against any party thereto before or after maturity, without consideration, by an absolute renunciation thereof. This doctrine "seems to have been consciously imported into the law merchant from French law." (See opinion of Parke, B., in *Foster* vs. *Dawber*, 6 Exchequer, at p. 852, A. D. 1851.) By the Bills of Exchange Act, 1882, § 62 (1), the renunciation is required to be in writing. In the U. S. this exception is not recognized generally. The weight of authority is in favor of applying the general rule, even to commercial paper, that a right of action can be discharged only by contract or estoppel. 1 Daniels, *Negotiable Instruments*, § 544.

Whether the right is conferred by law or by contract, the facts upon which it is based must be known to its possessor in order that his acts relating to it should operate as a waiver; but it is not necessary that he know the legal effect of the facts or of his acts. This is well illustrated by the case of an indorser of commercial paper. If the paper is not duly presented for payment and the indorser duly notified of its dishonor, he is discharged from liability. This discharge may be waived by the indorser's promising to pay the paper, provided he knows the facts, although he is ignorant that the legal effect of these facts was to discharge him. (*Rindskopf* vs. *Doman*, 28 Ohio St. 516.) Waiver of presentment and notice is discussed in BILL OF EXCHANGE (*Presentment for Payment*), and waiver of tort in QUASI CONTRACTS. FRANCIS M. BURDICK.

Waizen: See WAITZEN.

Wakash'an Indians [*Wakashan* is from *wakash*, the Nootka word for "good," mistaken for the name of a tribe]: a linguistic stock of North American Indians, also called Nootka. The languages spoken by the Aht of the west coast of Vancouver island and the Makah (Kaasath or Klaizaht) of Cape Flattery, congeneric tribes, and the Haeltzuk and Kwakiutl peoples of the east coast of Vancouver island and the opposite mainland of British Columbia, were at first regarded as representing two distinct families, but through the investigations of Dr. Franz Boas it is now possible to unite them on the basis of radical affinity. The Wakashan family, thus constituted, comprised about 8,000 Indians in 1890; it consists of two groups of tribes—the Aht, including twenty-two tribes, with over 3,600 members, and the Haeltzuk, including about twenty tribes, among them the Haeltzuk proper, the Wikeno (these two being often called Belbella or Millbank Sound Indians), and the three tribes commonly called Kwakiutl.

Habitat.—The tribes of this family occupy a large part of the west coast of Vancouver island, extending from Woody

Point on the N., in about lat. 50° 7′, to Nitinaht Bay on the S., in lat. 48° 40′. They also occupy the adjoining islands and the opposite mainland coast of British Columbia from about Bute Inlet, in 50° 10′ N. lat., to Millbank Sound. The tribes of the Aht division are confined chiefly to the west coast of Vancouver island. They range as far N. as Cape Cook, the northern side of that cape being occupied by tribes of the Haeltzuk division. On the S. they reached nearly to Sooke Inlet, that inlet being in possession of the Soke, a Salishan tribe. The neighborhood of Cape Flattery, Wash., is occupied by the Makah or Tlaasath, one of the Aht tribes, who probably wrested this outpost of the Wakashan Indians from the Clallam, a Salishan people, who next adjoin them on Puget Sound. The Haeltzuk tribes occupy the northern part of Vancouver island, adjoining the Aht and Salishan territories, and the west coast of British Columbia, having the Chimmesyan Indians on the N., the Taculli tribes (Athapascan) and the Bilqula (Salishan) on the N. and E., and Salishan tribes on the S. E.

General Characteristics.—All the tribes derive the greater part of their subsistence from the sea. Armed with harpoons of their own manufacture they frequently attack and overcome the whale. They appear to have been always aggressive and warlike, and are very conservative in changing their habits and adapting themselves to the ways of civilization. Their houses are large communal structures covered with boards of their own manufacture, which are carried from place to place as they change their residence. They are especially skillful in basket-making. Head-flattening prevails among them to some extent, though not so largely as among the Chinook and some other tribes. Slavery largely prevailed among all the tribes. The women and children taken in war or obtained by purchase seem to have been invariably used as slaves, as also all the captured men who were not killed out of revenge. The language possesses a number of dialects which probably do not differ greatly. According to Sproat, the Nitinaht language (this tribe is one of the Aht group) is understood throughout the group. In the essentials of life the Haeltzuk tribes do not differ markedly from their neighbors of the Aht division, or from the Haida. The Wakashan Indians are skilled in the various rude arts practiced by barbaric peoples, but they do not exhibit the same superiority in carving, boat-building, etc., that distinguishes the Haida. The villages consist usually of a single row of houses facing the sea and placed upon the edge of the beach. The various practices relating to the custom of "potlatch"—that is, the free distribution of property on certain ceremonial occasions—prevail as extensively among these tribes as among the others of this region. Among the Haeltzuk tribes, as among the Kolusehan, the Haida, and the Chimmesyan, territorial rights are peculiarly well defined. Not only has each tribe its own sea-fishing grounds, its own salmon-streams from which it alone has a right to take fish, and its own hunting and berry grounds, but within the tribe each gens likewise has its own territory. According to Boas, descent and inheritance among the Haeltzuk tribes are in the male line. Comparatively little is known of the Haeltzuk language, but a sufficient number of vocabularies have been gathered to show the existence of several dialects. There is no social or political bond of union between the various tribes of this family of late years, as several of the smaller tribes have decreased in numbers, moved from their old territory, and become amalgamated with stronger tribes, so that in a number of cases the main or winter village is occupied by several tribes. See INDIANS OF NORTH AMERICA. JAMES OWEN DORSEY.

Wake [from O. Eng. *wacu* (in *niht-wacu*), a watch, deriv. of *wacan*, wake; cf. Lat. *vi'gil*, wakeful, watchful, *vigi'lia*, a watch, wake]: in old English usage, the equivalent of VIGIL (*q. v.*). In many British parishes the term and custom still survive in the "country wakes," festivities of ancient origin which are kept up on the eves of certain saints' days. The *lyke-wake*, in which the neighbors of a deceased person hold a watch over the dead body, is a custom of entirely different character. It is found among the lower classes in several countries, notably among the Irish.

Wake, WILLIAM, D. D.: archbishop; b. at Blandford Dorsetshire, England, in 1657; studied at Christ Church, Oxford; graduated 1676; took orders in the Church of England; became chaplain to the English embassy in France; had a theological controversy with Bossuet, arising from what he claimed to be a misrepresentation of the doctrine of the Church of England, 1686–88; became preacher to Gray's Inn, canon of Christ Church 1689, chaplain to King William, rector of St. James, Westminster, 1693, dean of Exeter 1701, Bishop of Lincoln 1705, Archbishop of Canterbury 1716, and discussed with Dupin a project for the union of the English and Gallican Churches 1718. He was author of several controversial publications against Bishop Atterbury, three volumes of *Sermons*, and an excellent translation of the *Apostolical Fathers* (1693). D. in his palace at Lambeth, London, Jan. 24, 1737.

Revised by S. M. JACKSON.

Wakefield: capital of the West Riding of Yorkshire, England; on the Calder; 9 miles S. S. E. of Leeds (see map of England, ref. 7–H). The cathedral, a Perpendicular building, was founded in 1329 and restored 1857–86. A town-hall, French Renaissance in style, was erected in 1880. Wakefield has been the seat of a bishopric since 1888. Its manufactures of cloth and yarn have declined, but are still considerable. The Yorkist forces suffered a defeat here Dec. 31, 1460. Pop. of the parliamentary borough, returning one member (1891), 37,269.

Wakefield: town (incorporated in 1868); Middlesex co., Mass.; on the Boston and Maine Railroad; 10 miles N. of Boston (for location, see map of Massachusetts, ref. 2–H). It contains the villages of Wakefield, Greenwood, and Montrose; has electric lights, electric street-railway, fine water-supply, two large lakes, public park, high school, 26 district schools, public library of about 12,000 volumes, a national bank with capital of $100,000, a State bank with capital of $10,000, a savings-bank, and a daily and 3 weekly papers. There are manufactures of rattan goods, pianos, and shoes, and iron and brass foundries. Pop. (1880) 5,547; (1890) 6,982; (1900) 9,290. EDITOR OF "CITIZEN AND BANNER."

Wakefield: village; South Kingstown township, Washington co., R. I.; at the head of Point Judith inlet and on the Narragansett Pier Railroad; 5 miles S. of Kingston, 30 miles S. by W. of Providence (for location, see map of Rhode Island, ref. 10–N). It is principally engaged in farming and in the manufacture of cotton and woolen goods, and has a trust company with capital of $100,000 and a weekly newspaper. Pop. (1890) 2,200; not returned separately in 1900.

Wakefield, EDWARD GIBBON: writer on theories of colonization; b. in London, England, Mar. 26, 1796; educated to the business of a land-surveyor; was brought into public notice in 1826 from having eloped to Gretna Green and there married an heiress fifteen years of age, for which act he was tried and sentenced to confinement for three years. During his imprisonment he studied colonial questions, and after his liberation took part in promoting the colonization of South Australia. In 1838 he accompanied the Earl of Durham to Canada as his private secretary, and rendered valuable service in the introduction of the new form of government, and subsequently removed to New Zealand, a colony which owed its existence largely to his efforts, and where his brother, Col. William, and his son, Edward Jerningham, had been (1839) pioneer settlers. D. at Wellington, New Zealand, May 16, 1862. The distinctive principle of the Wakefield system much resembles that of the homestead and pre-emption legislation of the U. S., consisting in selling lands in small lots and at low prices to actual settlers, and employing the proceeds as a fund for the transportation of fresh emigrants.

Wakefield, GILBERT: classical scholar and theologian; b. at Nottingham, England, Feb. 22, 1756; graduated at Cambridge; appointed curate of Stockport, Cheshire, and of St. Peter's, Liverpool, 1778, but resigned and did not join any other religious body; classical tutor at the Nonconformist Academy at Warrington 1779–83, and at the Unitarian College at Hackney 1790–91; engaged in controversies with Porson and other classical scholars (see his correspondence with Charles James Fox, published 1813); imprisoned in Dorchester jail from 1798 to May, 1801, for a "seditious" pamphlet, written in reply to Bishop Watson's *Address to the People of Great Britain*. D. at Hackney, Sept. 9, 1801. Among his publications are *An Enquiry into the Expediency and Propriety of Social Worship* (1793), answering the question negatively; *Silva Critica* (1789–95); *Tragicorum Delectus* (1794); *Horace* (1794); *Virgil* (1796); and a critical and exegetical edition of *Lucretius* (3d ed. 1821). See his *Autobiography* (1792; 2d ed. 1804).

Wake Island: See the Appendix.

Wakeman, HENRY OFFLEY: See the Appendix.

Wakley, Thomas, M. D.: surgeon; b. at Membury, Devonshire, England, in 1795; studied medicine and surgery in London, attending the lectures of Sir Astley Cooper 1815; practiced some years as a surgeon in London; retired from active practice in 1823, when he founded in London *The Lancet*, a weekly medical journal, which he edited nearly forty years, and which has been instrumental in promoting many reforms in surgery and medicine. Dr. Wakley was coroner for Middlesex 1839–62, and sat in Parliament 1835–52. D. in the island of Madeira, May 16, 1862.—His son, James Goodchild Wakley (b. at Brompton, London, England, in 1825; d. in London, Aug. 30, 1886), succeeded him in the editorship of *The Lancet*.

Revised by S. T. Armstrong.

Walafridus Strabus: See Strabo, Walahfrid.

Walcheren, *vaăl'cher-en*: island of the Netherlands, forming part of the province of Zealand, between the East and West Scheldt and the North Sea. It is 11 miles long and 10 miles broad, with an area of 81 sq. miles, and has 45,000 inhabitants. The chief town is Middelburg. It is low, and is protected against inundation partly by natural downs, partly by immense dikes, the rupture of which has on more than one occasion been most disastrous, but it is very fertile, and contains fine tracts both of meadow and arable land. The northern part of the island is well wooded. Walcheren is famous in military history for the disastrous expedition of the British under Lord Chatham and Admiral Strachan in 1809. It was aimed against Antwerp and might, if successful, have roused North Germany against Napoleon, but it was late in starting, and time was wasted in trying to reduce Flushing. Lord Chatham was utterly incapable as a leader, and Lord Castlereagh, who had planned the expedition, failed to provide the necessary supplies. After the delay at Flushing the army was quartered in the island of Walcheren. By the time Chatham was ready to attack Antwerp, Bernadotte had come to its assistance, and, as the British forces had been greatly reduced by disease, success was hopeless. It was decided, however, to retain possession of Walcheren, and it was garrisoned by a force of 15,000 men until Dec., 1809. Over 7,000 men lost their lives in the expedition, which was an utter failure. Revised by M. W. Harrington.

Walckenaer, *vaăl-ke-naar'*, Charles Athanase, Baron: scientist; b. in Paris, Dec. 25, 1771; was drafted into the army in 1793; became a mayor of Paris in 1816; entered the civil service during the Restoration, and was appointed prefect of the department of Nièvre in 1824 and of that of Aisne in 1826; retired from public life in 1830, and devoted himself exclusively to science; was chosen perpetual secretary of the Academy of Inscriptions in 1840. His most remarkable works are *Faune parisienne des Insectes* (1805); *Tableau des Aranéides* (1805); *Histoire naturelle des Insectes aptères* (1837); *Le Monde maritime* (1818); *Géographie historique et comparée des Gaules* (1839); *Histoire de la vie et des ouvrages de La Fontaine* (Paris, 1820); *Mémoires* on Madame de Sévigné (5 vols., 1842); he also published *Nouvelle Collection de Voyages* (21 vols., 1826–31). D. in Paris, Apr. 27, 1852. Revised by A. G. Canfield.

Walcott, Charles Doolittle: paleontologist and geologist; b. at New York Mills, Oneida co., N. Y., Mar. 31, 1850; became assistant to Prof. James Hall, State geologist of New York, in 1876; entered the U. S. Geological Survey in 1879 as assistant geologist, and became paleontologist 1883, chief paleontologist 1891, geologist in charge of geology and paleontology 1893, and director 1894. Among his writings are *The Trilobite: New and Old Evidence Relating to its Organization* (Bull. Mus. Comp. Zoöl., vol. viii., No. 10, 1881); *Paleontology of the Eureka District, Nevada* (Monograph 8, U. S. Geol. Surv., 1884); *The Cambrian Faunas of North America* (Bull. 10, U. S. Geol. Surv., 1885); *Second Contribution to the Studies of the Cambrian Faunas of North America* (Bull. 30, U. S. Geol. Surv., 1886); *The Taconic System of Emmons* (*Am. Jour. Science*, vol. xxxv., 1888); *The Fauna of the Lower Cambrian or Olenellus Zone* (10th Ann. Rept., U. S. Geol. Surv., 1890); *Correlation Papers, Cambrian* (Bull. 81, U. S. Geol. Surv., 1891).

Waldeck, *vaăl'dek*, Jean Frédéric, de: traveler, archæologist, and artist; b. in Paris, Mar. 16, 1766. When a young man he was with Levaillant in South Africa; subsequently he studied art, but during the French Revolution he entered the army, served under Bonaparte in Italy, and followed him to Egypt in 1798, though he was not in active service there. On the failure of the Egyptian expedition Waldeck, with four companions, undertook a perilous exploration over the desert of Dongola, from which he alone returned. Later he was at Mauritius, and in 1819 went with Cochrane to Chili, whence he passed to Central America. He settled as an engraver in London in 1822, but in 1825 returned to Central America, and, aided by a small grant from the French Government, spent twelve years studying the ruins of Southern Mexico and Guatemala, and making careful drawings of them. A large portion of his notes and drawings were lost; the remainder were sold to the French Government, and from them he lithographed many of the plates for the *Monuments anciens du Mexique*, published in 1866, after he had passed his hundredth year. He published independently *Voyage archéologique et pittoresque dans le Yucatan* (1837). D. in Paris, Apr. 29, 1875. H. H. S.

Waldeck-Pyrmont: a principality of Northwestern Germany with one vote in the federal council and one in the imperial diet. It consists of two separate parts—the former county of Waldeck, surrounded by Prussian territory, with an area of 407 sq. miles and 57,913 inhabitants (1900), and the principality of Pyrmont, 30 miles to the N., between Hanover, Lippe, and Brunswick, with an area of 26 sq. miles and 8,104 inhabitants. Waldeck is, for the most part, hilly. The rivers Diemel and Eder in Waldeck and the Emmer in Pyrmont belong to the Weser system. The mountainous parts are not fertile, only 55·5 per cent. of the soil being utilized for fields, gardens, and pastures, while 36 per cent. is forest-land. Grain, especially rye and oats, potatoes, and flax, are the principal products; wood, iron, salt, slate, marble, and sandstone form the chief exports; cattle-raising is extensively carried on. The chief drawback of the country is the absence of railways, the Prussian railway system touching only the extreme southeastern part of the principality. The capital and residence of the prince is Arolsen, in Waldeck, with (1890) 2,620 inhabitants, but the government is practically in Prussian hands under a *Landesdirektor*. Hermann Schoenfeld.

Walden: village; Orange co., N. Y.; on the Walkill river, and the Walkill Valley Railroad; 12 miles N. W. of Newburg, and 73 miles N. by W. of New York (for location, see map of New York, ref. 7–J). It contains woolen-mills, cutlery-works, foundries, manufactories of engines and soap, a national bank (capital $50,000), and a savings-bank, and has two weekly newspapers. Pop. (1890) 2,132; (1900) 3,147.

Walden, or **Walden'sis**, Thomas, whose family name was Netter: ecclesiastic; b. at Saffron Walden, Essex, England, about 1375; educated at Oxford; entered the Carmelite order in London, and was ordained sub-deacon 1395; was at the Council of Pisa 1409; on his return became and remained a leading prosecutor of the Wyclifites or Lollards, and is known to have been present at the trials of William Tailor (1410) and Sir John Oldcastle (1413); and to have publicly rebuked Henry V. because he was slow about punishing the heretics. He became a provincial prior of the English Carmelites 1414; attended in that capacity the Council of Constance 1415; went to Lithuania 1419; founded there several houses of his order, and negotiated a peace between the King of Poland and the Teutonic Knights; converted the Duke of Lithuania to the Catholic Church, whence he was styled the "Apostle of the Lithuanians"; was confessor to Henry V., whom he attended on his deathbed (1422), and became confessor to his son Henry VI.; accompanied Henry VI. to France, and died at Rouen, Nov. 2, 1430. He instituted the order of Carmelite nuns in England, and in many other ways served his order, which in gratitude has enrolled him among the saints. He was the author of treatises, *Doctrinale antiquum Fidei Ecclesiæ Catholicæ contra Wiclevistas et Hussitas*, and *De Sacramentis*, and is supposed to have been the writer of the series of tracts entitled *Fasciculi Zizaniorum Johannis Wyclif* (Bundles of Wyclif's Tares), consisting of seven portions, the first two of which were first edited by Dr. W. W. Shirley in the Rolls Series (1858).

Revised by S. M. Jackson.

Walden'sian Church [named from Peter Waldo (see below)]: the oldest Protestant Church in the world, and one of the three native Evangelical churches in Italy, the others being the Evangelical Church of Italy, which was organized in 1865, and the Reformed Catholic Church, a branch of the old Catholic movement which originated in Germany with Döllinger.

Origin and Home.—The Waldensian valleys are in the north of Italy in the midst of the Cottian Alps, about 30 miles S. W. of the city of Turin, the capital of Piedmont.

The territory occupied by Waldenses is from 24 to 25 miles in length and from 14 to 15 in breadth. The chief place is Torre Pellice, with 5,000 inhabitants, where there is a college for boys and a high school for girls. The Waldenses, numbering from 25,000 to 26,000, are chiefly peasants living in small villages. It is now generally agreed among church historians that there is no evidence that the Waldenses were in existence as a separate organization before the days of Peter Waldo, who is accordingly said to be their founder. The question, however, is far from being settled. But even if the connection between Waldo and the Waldensians be denied, it is proper here to say a few words about a reformer whose doctrines are so much like those professed by the Waldenses themselves. Peter Waldo, rich and respected by his fellow citizens of Lyons, was one day in 1173 conversing with friends, when suddenly one of them fell dead at his feet. That tragical event was the means of turning his attention to spiritual things. He engaged at once two ecclesiastics to prepare for him a vernacular translation of several portions of the Holy Scriptures and of the Fathers. He began to read the word of God in his own tongue, but found no peace. One day he saw a large crowd of people listening to a minstrel who was singing the praises of St. Alexis, who had left all and had gone to the East to do penance. Waldo thought it his duty to do the same, and was confirmed in his opinion by a canon whom he had consulted, who said to him, "If thou wilt be perfect, go and sell that thou hast, and give to the poor." He then gave part of his property to his wife and to his daughters, and part to the poor, and began to preach in the streets of Lyons. His aim was to revive the fervent, simple, self-denying piety of the primitive Church. He emphasized the right and duty of every Christian to study the Scriptures for himself. His followers styled themselves The Poor, others called them Leonistæ, from Lyons, or Sabatati, because they wore *sabots*, or wooden shoes. Waldo, silenced by the Archbishop of Lyons, appealed to the pope, Alexander, who gave him a cordial reception, approved his vow of poverty, but advised him not to preach unless he had the permission of the local clergy. In 1184 he was condemned by the Council of Verona and anathematized by Pope Lucius III. The date of his death is not known. His followers increased greatly, and some crossed the Alps and joined the Waldenses, who were steadily spreading over the north of Italy.

History to 1848.—Every period in the history of the Waldenses is marked by a new persecution by Rome and by the Dukes of Savoy, who too often were but the humble servants of the popes. In 1487, under Pope Innocent VIII., Alberto Cataneo invaded the valleys at the head of 18,000 regular troops; being repulsed, he crossed the Alps and avenged himself by destroying the Waldenses of Val Louise. In 1655 occurred the most severe trial to which the Waldenses were subjected. An army, composed partly of French troops of Louis XIV., partly of Irish soldiers, entered the valleys and spread destruction on every side. They treated the people with terrible barbarity, so that the conscience of Europe was aroused, and England under Cromwell called on the Protestant powers to join in remonstrance to the Duke of Savoy and the French king. The massacre to which the people were subjected called forth Milton's immortal sonnet beginning, "Avenge, O Lord, thy slaughtered saints." In 1686 the Waldenses, obliged by Victor Amadeus II. to choose between their religion and their country, after a hard struggle went into exile in Switzerland and Germany. In 1689 one of their pastors, Henry Arnaud, led a band of 800 men to the reconquest of their country, and succeeded. For a while the Waldenses were left in peace, but not long afterward all the Protestants who were not born in the valleys were obliged to leave them, and emigrated to Würtemberg. Henry Arnaud, the brave leader and faithful pastor, being born in France, was obliged to accompany them. He died in Schönberg, Sept. 8, 1721, after a faithful ministry. In short, it may be said with truth that the only time in which the Waldenses, during their long and eventful history, enjoyed real freedom was during the French Revolution and when Napoleon I. ruled over Italy. At last, on Feb. 17, 1848, King Charles Albert proclaimed the constitution and granted them religious toleration, toleration which now, by the force of events, has been changed into freedom.

Doctrinal History, Development, and Polity.—It is commonly asserted that the Waldensian Church was never reformed because it did not need reformation, having kept the Gospel in its purity. That opinion, so fondly entertained by many, is not in accordance with the facts. The fundamental doctrines of the early Waldenses were: "We must obey God rather than man; we must follow Christ in his poverty and reclaim a crooked generation by the free preaching of the Gospel. Two are the ways, one leads to perdition, the other to eternal life. Purgatory exists, but in this life only. The intercession of saints is useless, and useless their worship." They had the triple vow of chastity, poverty, and obedience. They worshiped God, and held the Virgin Mary in veneration. They practiced confession, but their teachers pronounced the absolution in this way, "May God absolve thee from thy sins." They disapproved of capital punishment. Their missionary spirit was great, and their knowledge of the Scriptures was wonderful for the times. Later on, when persecution had crushed so many of them, they were more lax in their observances; their ideas about many points of doctrine were confused, as appears from a letter which two delegates, Maurel and Masson, laid before the Swiss and German reformers. From that letter it would appear that the Waldenses received the sacraments of baptism and Holy Communion from the regular priesthood; that they acknowledged the seven sacraments of Rome, but gave them a spiritual meaning; that clerical celibacy was their rule, though they admitted that it created a great many disorders. The reformers, Œcolampadius, Bucer, Farel, advised and enlightened them on many points. "We admit," they said, "but two sacraments, baptism and the Lord's Supper, and they are symbolical. The canon of Holy Scriptures must be expunged, and the apocryphal books left aside. It is not against the Gospel to take an oath, matrimony is honorable for every man, the apostle did not prescribe celibacy; you must not outwardly submit to the ordinances of the Church." "God," said Œcolampadius, "is a jealous God, and does not permit his elect to put themselves under the yoke of Antichrist." At a synod held at Chanforans in 1532 in the valley of Angrogna a new confession of faith was adopted, which assimilated the practices of the Waldenses to those of the Swiss congregations, renounced for the future all recognition of the Roman communion, and established their worship no longer as a secret meeting of a faithful few, but as public assemblies for the glory of God. Henceforth the Waldenses were absorbed in the general Protestant movement of Europe. At the same synod 500 pieces of gold were set aside by the small Church for the purpose of having the Bible translated and printed in French. In due time the Bible of Olivetan was published at Neuchâtel, Switzerland, with this date, "From the Alps, the 12th of February, 1535." At the beginning of the nineteenth century the piety and the missionary spirit of the Waldenses had lost much of their former fervor. Félix Neff revived their faith; Canon Gilly, of Durham, by his book, *A Visit to the Valleys of Piedmont*, drew the attention of the Christian Church to this interesting people. Moved by that book, which he chanced to see in the library of the Duke of Wellington, Col. Beckwith visited the Waldenses in 1827, settled among them, and for thirty-five years devoted himself to the promotion of their welfare. He married an accomplished Waldensian lady, lived among the people, established 120 primary schools, and was the means of building the fine Waldensian church in Turin.

Ecclesiastical Polity.—This is now undoubtedly Presbyterian, very much resembling that of the Church of Scotland. The Waldenses are admitted in the Pan-Presbyterian council as a Presbyterian body. But it is by no means proved that this was their primitive form of government. Gilly, an Episcopalian, intimates that Presbyterianism was thrust upon them in the year 1630. In that year all the pastors, with but three exceptions, were removed by the plague which devastated the valleys. Recourse was had to Geneva and France for a supply of preachers, and those who were sent being Presbyterians, brought with them and established in Piedmont that form of Church polity which now prevails. The Moravian Brethren go so far as to affirm that their first bishop received the Episcopal ordination from Stephanus, bishop of the Valleys. Whether that opinion is true or not can not be affirmed with certainty. The fact is that the Waldenses, although Presbyterian, differ somewhat from the Presbyterian Churches in some respects. They keep Christmas, Good Friday, Easter, and Ascension Day. They have the rite of confirmation as in the Episcopal Church; they have a liturgy, and the ministers are at liberty to use it or not. Their Synod, which corresponds to the General Assembly of the Presbyterian Church, meets

once a year and is composed of all the ordained ministers of the home church and of the mission field. The lay deputation is composed of two delegates (not necessarily ruling elders) from every parish in the valleys and one delegate for every 400 communicants in the mission field. During the interval between two synods the administration of the home church rests on a board of five members, and the administration of the mission field on the Committee of Evangelization, composed of seven persons. The seminary of the Church is in Florence. Those who wish to be enrolled as regular theological students must have a Government diploma which corresponds to the degree of M. A. in England. The curriculum lasts three years, nine months every year. There are three professors.

History since 1848.—After the Waldenses received their civil and religious freedom in 1848 they began a work of evangelization among their countrymen. Amidst great difficulties they have succeeded in establishing in the Italian Peninsula and in the islands of Elba, Sardinia, and Sicily, 44 churches, ministered to and superintended by 43 pastors. Kindred to these there are also 47 stations with 47 evangelists and 8 teacher evangelists. The number of communicants in the mission field is 5,018, the number of adherents 55,000; the contributions from the mission churches $15,200. Connected with the missions there are 29 day-schools, with 54 teachers and 2,397 scholars. There are also 12 night-schools for adults, and specially for workingmen whose education has been insufficient or utterly neglected in their boyhood. In these schools there are 370 scholars. There are 61 Sunday-schools with 3,119 pupils.

The 25,000 or 26,000 Waldenses living in the valleys, of whom 14,248 are church-members, have 20 pastors, 17 parishes, 4,804 children in the day-schools, with 300 teachers and 3,290 children in the Sunday-schools. The contributions from the churches for all purposes were in 1894 $14,000. Besides the Waldenses in the valleys, there are at least 2,000 in the city of Turin and some hundreds scattered throughout Italy, engaged either in business or in teaching. There is a large colony in Marseilles. About 1850 several hundreds left their mountains and went to colonize Rosario in the Argentine Republic. They number now 2,500, have two pastors and good schools, and are prospering. In the U. S. there are two colonies of Waldenses, one in Monett, Mo., and one in North Carolina.

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Waldensis: See Walden, Thomas.

Waldersee, Alfred, Count von: soldier; b. in Potsdam, Germany, Apr. 8, 1832; entered the army in 1850 and served with distinction in the campaigns of 1866 and 1870–71. In 1881 he was made quartermaster-general and deputy of Count von Moltke, whom he succeeded as chief of the general staff of the German army in 1888. He married in 1874 the widow of Prince Frederick of Schleswig-Holstein-Sonderburg-Augustenburg, *née* Mary Esther Lee, of New York. He commanded the allied armies in China in 1900.

Waldeyer, Heinrich Wilhelm Gottfried, M. D.: anatomist; b. at Hehlen, Brunswick, Germany, Oct. 6, 1836; studied mathematics and natural sciences at the University of Göttingen, but subsequently applied himself to medicine; studied anatomy under Henle at the University of Greifswald, and then went to the University of Berlin where he graduated M. D. in 1861. From 1862–64 he was an assistant to von Wittich in the physiological institute of the University of Königsberg; from 1864–65 he was assistant to Heidenhain in the University of Breslau, where in 1865 he was made extraordinary and in 1867 regular professor of pathological anatomy. In 1872 he was appointed Professor of Anatomy in the University of Strassburg, leaving in 1883 to go to the University of Berlin. He is the author of a number of monographs on anatomy and embryology, and assistant editor of the *Archiv für mikroskopische Anatomie*.

S. T. Armstrong.

Waldo, Peter: See Waldensian Church.

Waldoboro: town (settled by Germans in 1749, incorporated in 1773); port of entry; Lincoln co., Me.; on the Medomak river, and the Maine Cent. Railroad; 19 miles W. of Rockland, 19 miles E. N. E. of Wiscasset (for location, see map of Maine, ref. 10–D). It is in an agricultural region, was formerly noted for its ship-building interests, has a U. S. custom-house, public high school, a national bank with capital of $50,000, and a weekly newspaper, and is principally engaged in the manufacture of shoes and clothing. Pop. (1880) 3,758; (1890) 3,505; (1900) 3,145.

Editor of "Lincoln County News."

Waldseemüller, or **Waltzeemüller**, *vaalt'zā-mül-ler*, Martin (in the Greek form, which he adopted in accordance with the fashion of his time, *Hylacomylus*): geographer; b. at Freiburg, Germany, about 1470. During several years, from 1504, he was Professor of Geography in the College of St. Dié in the Vosges. There, in 1507, he published a small treatise in Latin, entitled *Cosmographiæ introductio*, with translations of the letters of Vespucci as an appendix. This work is chiefly remarkable because the name America was first proposed in it. (See Vespucci.) Several editions of it were printed on the college press, but all are now extremely rare; the few copies in American libraries have been purchased for enormous prices and are treasured with great care. In conjunction with other scholars at St. Dié, Waldseemüller prepared an edition of Ptolemy, which was published at Strassburg in 1513; it is remarkable that the name America does not appear in this work, though it has some curious maps of the New World.

Herbert H. Smith.

Waldstein, CHARLES: See the Appendix.

Wales [from O. Eng. *wealh*, plur. *wealas*, foreigner, especially a Celt or Welshman (: O. H. Germ. *walh*,) whence by deriv. *welisc*, foreign, especially Celtic (> Eng. *Welsh*): Germ. *wälsch*, foreign]: a principality; since 1282 an integral part of the kingdom of England. It has an area of 7,363 sq. miles.

Physical Features.—The two-horned peninsula of Wales extends from Liverpool Bay to Bristol Channel, and is bounded on the W. by St. George's Channel, which separates it from Ireland (see map of England and Wales). The fertile plain of Cheshire and the valley of the Severn form the natural boundary between England and the mountain region of Wales, but the present political boundary lies much farther to the W. The Welsh Hills or Cambrian Mountains attain their greatest height in Snowdon (3,570 feet), close to Menai Strait, which separates the mainland from the dependent island of Anglesey. A depression at the head of the Severn separates North from South Wales, and the hills of the latter are particularly distinguished by their barrenness, their highest range being known as Black Mountains (Brecknock Beacon, 2,910 feet), from the color of the heather which covers them. The only level tract of any extent is the Vale of Glamorgan on the Bristol Channel, but there are many valleys distinguished for their loveliness, especially those of the Wye in the south and of the upper Dee in the north. The coast is generally bold and rugged. At the southwest extremity of the peninsula a fiord, known as Milford Haven, penetrates far inland, and forms one of the most secure harbors of the British islands, although, owing to its remoteness, it is but little used.

The Dee, Severn, and Wye rise in Wales, but in each case the lower, navigable course is through England, and except the Tawe, Taff, and Conway, none of the exclusively Welsh rivers is navigable. The only lake of any size is that of Bala.

Geologically, Wales is the most ancient soil of Great Britain, and its mountains, built up of Laurentian, Cambrian, and Silurian rocks, reared their summits long before England emerged above the sea. These ancient rocks are pierced, as in Scotland, by granite, porphyry, and other igneous rocks, and in the south a belt of Devonian rocks intervenes between them and the coal-basin of Glamorganshire.

Industries.—Wales is in the main a pastoral country, for of its area only 20 per cent. is under the plow, while 41 per cent. consists of grass-lands and 9 per cent. of mountain pasture. The woods cover 3·5 per cent. The live stock includes 666,000 head of cattle and nearly 3,000,000 sheep. Coal and iron abound, Glamorganshire alone raising nearly 22,000,000 tons of the former, half of which is exported annually through Cardiff, the greatest coaling-port of the United Kingdom. Lead, copper, and gold are found, and roofing-slates in large quantities are exported from North Wales. Iron and steel works have sprung up in the coal-basins, but among other industries that of flannels and woolens is of most importance.

Population.—The population between 1881 and 1891 increased from 1,360,513 to 1,518,914 souls, but the increase was confined to the counties of Glamorgan (increase, 175,785), Carmarthen, and Denbigh, while throughout the remainder of the principality there was a decrease. The only large towns are Cardiff (128,849), Swansea (90,423), and Merthyr Tydvil (58,080).

English is the language of commerce and of culture, but Welsh is still spoken by 51 per cent. of the population. The Church of England is still the established church in Wales, but in the greater part of the country the majority of the people have turned their backs upon it, and adopted the teaching of various Dissenting bodies, among which the Calvinistic Methodists are the most numerous. Education is not as far advanced as in England, but there are 4 university colleges (91 professors, 929 students), of which one has the power to confer degrees, 10 theological colleges, 4 training institutions, and 12 public grammar schools. See WELSH LANGUAGE and WELSH LITERATURE.

History.—Wales from the most remote time was divided into a number of petty kingdoms or principalities, and only at long intervals did its tribes submit to the authority of a single ruler. Under the Romans, who established themselves in the country about 50 A. D. after the defeat of the Silures and Ordovices, Wales, or rather Cambria, formed part of Britannia Secunda. Isca (now Caerleon), Venta Silurum (Caergwert), and Segontium (near Carnarvon) were the principal towns. Christian missionaries first arrived in the fourth century. After the retirement of the Romans the wars between the Welsh and Saxons were incessant. Athelstan (925–941) imposed a tribute upon the Welsh, which they paid, however, only for a time. William the Conqueror (1066) again reduced them to obedience, and his son, William II., settled the Lords Marchers along the borders of Wales to protect England against their incursions, and founded a Flemish colony in Pembrokeshire. On the accession of Edward I. (1272) the Welsh prince Llewelyn (Llywelyn ap Gruffydd) refused to do homage; but, after the betrayal and murder of that prince (1282) and the execution of his brother David at Shrewsbury, the nobility of Wales submitted to the king, and Wales was finally united with England, the title of Prince of Wales being bestowed upon the king's infant son, then recently born at Carnarvon Castle. The last effort of the Welsh to recover their liberty was made in 1400 under the leadership of Owen Glendower (Owain Glyndwr), a descendant of the old princes. In 1546 Henry VIII. abolished the government of the Lords of the Marches, united Monmouthshire, and divided the rest of Wales into twelve shires. Since then Welshmen have enjoyed all rights of Englishmen. See Woodward, *History of Wales* (1853); Borrow, *Wild Wales* (1888); Doran, *Book of the Princes of Wales* (1860). E. G. RAVENSTEIN.

Wales, PHILIP SKINNER: See the Appendix.

Wales, Prince of: See ALBERT EDWARD.

Wales, Princess of: See ALEXANDRA.

Walewski, *vaă-lev'skĕĕ*, ALEXANDRE FLORIAN JOSEPH COLONNA, Count: statesman; b. at Walewice, Poland, May 4, 1810; reputed to be the son of Napoleon I. and the Countess Walewska; was educated at Geneva; fought in the ranks of the Polish patriot army in 1831, and was sent in the same year to London to solicit a British intervention; went to France after the fall of Warsaw; entered the army as a captain, but soon gave up the military career, and devoted himself to politics and literature; wrote *Un Mot sur la Question d'Afrique* (1837), *L'Alliance anglaise* (1838), also a drama, *L'École du Monde* (1840), and founded the *Messager*, which he sold in 1840 to Thiers; entered the diplomatic service, and was *chargé d'affaires* to Buenos Ayres at the outbreak of the Revolution of 1848; from 1849 to 1854 was ambassador to Florence, Naples, and London, successively; was Minister of Foreign Affairs May 7, 1855–Jan. 4, 1860, Minister of State Nov. 24, 1860–June 23, 1863, and president of the Legislative Assembly Sept. 1, 1865–Apr. 2, 1867. The emperor bestowed on him the title of duke in 1866. D. at Strassburg, Oct. 27, 1868.

Revised by F. M. COLBY.

Walhalla or **Valhalla**, *vaăl-haal'laă* [= Germ., from Icel. *valhöll*, liter., hall of the slain; *valr*, slain + *höll*, hall]: a marble temple of fame, built to commemorate the wars between Germany and France which ended with the downfall of Napoleon I. in 1815. It was begun in 1830, and finished in 1842. It stands on a hill on the Danube, at a place called Donaustauf, a few miles below Regensburg. It was conceived by Louis I. of Bavaria and planned by Leo von Klenze. It is a copy of the Parthenon, and is 232 feet long, 110 feet wide, and 63 feet high. Visitors ascend by marble steps from the foot of the hill, and the substructure and surroundings greatly enhance the grandeur and beauty of the building proper. The bas-reliefs, statues, and groups which adorn the edifice are the works of Schwanthaler, Rauch, and Johann Martin von Wagner. This temple was made for busts and statues of all the great men and women produced by Germany. It now contains 163 busts, and also a number of marble tablets giving the names of persons of whom no reliable portraits could be procured. It is one of the most remarkable buildings in all Germany. See VALHAL.

RASMUS B. ANDERSON.

Walk: See GAITS.

Walker, AMASA, LL. D.: political economist; b. at Woodstock, Conn., May 4, 1799; educated in the common school at North Brookfield, Mass.; became a merchant at Boston 1825; was a prominent advocate of the construction of the Western Railroad, an influential member of the early anti-slavery circles, and a leader in the cause of temperance, and visited Europe 1843 and 1849 as delegate to peace conventions. He was Professor of Political Economy at Oberlin College, O., 1842–49; representative in the Massachusetts Legislature 1848, member of the State Senate 1849,

Secretary of State 1851–1852; member of the State constitutional convention 1853, of Congress 1862–63, and of the Philadelphia loyalists' convention 1866; and lecturer on political economy at Amherst College in 1861–66. D. at North Brookfield, Mass., Oct. 29, 1875. He published *The Science of Wealth* (1866), and was one of the editors of the *Transactions* of the Agricultural Society of Massachusetts (7 vols., 1848–54). Revised by FRANCIS A. WALKER.

Walker, FRANCIS AMASA, Ph. D., LL. D.: soldier and statistician; son of Amasa Walker; b. in Boston, Mass., July 2, 1840; graduated at Amherst 1860; studied law under Judges Devens and Hoar at Worcester; entered the army 1861 as sergeant-major of Devens's regiment; became assistant adjutant-general of Couch's brigade Sept. 14, 1861, adjutant-general of Couch's division Aug. 11, 1862, lieutenant-colonel on staff of Second Army-corps Jan, 1, 1863, and brevet brigadier-general 1865; wounded at Chancellorsville; taken prisoner at Reams's Station, and confined in Libby prison, where his health was shattered; was a teacher at Williston Seminary, Easthampton, Mass., 1865–68; an editor of the Springfield *Republican* 1868–69; became chief of the bureau of statistics of the Treasury Department at Washington 1868; was superintendent of ninth U. S. census (1870); commissioner of Indian affairs 1871–72, and became in 1872 Professor of Political Economy and History in the Sheffield Scientific School of Yale College. He edited three 4to volumes of *Census Reports*, compiled a *Statistical Atlas of the United States* (1874), and published *The Indian Question* (Boston, 1874); *The Wages Question* (1876); *Money* (1878); and *Money, Trade, and Industry* (1879). Between 1879 and 1881 he conducted the tenth census, and superintended the preparation of the reports; was chosen president of the Massachusetts Institute of Technology in 1881; elected a correspondent of the Institute of France 1893. He published *Political Economy* (New York, 1883); *Land and its Rent* (1883); *History of the Second Army Corps* (1886); *Life of Gen. Winfield S. Hancock*, in the Great Commander Series (New York, 1894); and *The Making of the Nation* (1895). D. in Boston, Mass., Jan. 5, 1897.

Walker, FREDERICK: painter; b. in Marylebone, London, May 24, 1840; studied at the Royal Academy; became a wood-engraver; furnished drawings for several magazines; contributed to the exhibitions of the Society of Painters in Water-colors; and was made an A. R. A. in 1871. D. at St. Fillans, Perthshire, June 4, 1876. Among his oil-paintings, which are remarkable for their peculiar color effects, are *The Bathers*, *The Vagrants*, *The Old Gate*, *The Plough*, *The Harbor of Refuge*, and *The Right of Way*. There was an exhibition of about 200 of his pictures in London in 1876.

Walker, GEORGE, D. D.: the defender of Londonderry; b. in County Tyrone, Ireland, about 1650; educated at the University of Glasgow; took orders in the Church of England; was rector of Donoughmore, near Londonderry, Ireland, when James II. laid siege to that city 1689; gallantly defended Londonderry after it had been abandoned by its governor, and held out until the siege was raised, after 105 days' investment. He received the thanks of the House of Commons, and was nominated to the bishopric of Derry by William III. He was killed at the battle of the Boyne, July 1, 1690. He published *A True Account of the Siege of Londonderry* (1689) and a *Vindication*. His statue surmounts a lofty pillar at Londonderry.

Walker, Sir HOVENDEN: naval officer; b. in Somersetshire, England, about 1660; entered the navy at an early age; became a captain 1692, rear-admiral of the red 1709, and of the white 1710; was knighted by Queen Anne 1711; commanded in that year the unfortunate naval expedition which sailed from Boston against Canada; lost half his vessels by shipwreck on the Isle aux Œufs, and had to abandon the enterprise; attributed his failure to lack of support on the part of the New England colonists; afterward suffered the loss of his ship, the Edgar, which blew up at Spithead 1715, and he was thereupon dismissed from the service; subsequently settled in South Carolina as a planter, and published *A Journal or Full Account of the Late Expedition to Canada* (London, 1720). D. in Dublin, Ireland, in Jan., 1726.

Walker, JAMES, D. D.: preacher and educator; b. at Burlington (then Woburn), Mass., Aug. 16, 1794; graduated at Harvard College 1814; studied theology at Cambridge; was pastor of the Unitarian church in Charlestown, Mass., 1818–38; editor of *The Christian Examiner* 1831–39; Alford Professor of Moral and Intellectual Philosophy at Harvard 1838–53, and president of Harvard University 1853–60. D. at Cambridge, Dec. 23, 1874. He left his valuable library and $15,000 in money to the university. He was the author of *Sermons preached in the Chapel of Harvard College* (1861); *A Memoir of Daniel Appleton White* (1863); *A Memoir of Josiah Quincy* (1867); and a posthumous volume of *Discourses* (1876); delivered three series of *Lectures on Natural Religion* and a course of Lowell lectures on the *Philosophy of Religion*; published a number of occasional sermons and addresses, and edited as college text-books Dugald Stewart's *Philosophy of the Active and Moral Powers of Man* (Cambridge, 1849) and Dr. Thomas Reid's *Essays on the Intellectual Powers, abridged, with Notes and Illustrations from Sir William Hamilton and others* (Cambridge, 1850). Revised by J. W. CHADWICK.

Walker, JAMES BARR, D. D.: clergyman and author; b. in Philadelphia, Pa., July 29, 1805; became an operator in a factory at Pittsburg; subsequently was a printer; was clerk to Mordecai M. Noah in New York city; principal of an academy at New Durham, N. J.; studied law at Ravenna, O.; graduated at Western Reserve College, Hudson, O., 1831; edited successively *The Ohio Observer* at Hudson, the *Watchman of the Valley* at Cincinnati, and the *Watchman of the Prairies* (now *The Advance*) in Chicago, all religious newspapers; was also engaged in the book-trade; studied theology; was licensed to preach 1841, and was for a time a lecturer at Oberlin College and Chicago Theological Seminary. He was the author of *The Philosophy of the Plan of Salvation* (Boston, 1855, published anonymously under the editorship of Prof. C. E. Stowe), of which many thousand copies were sold in the U. S. and England, and which was translated into five languages; *God Revealed in Nature and in Christ* (1855), intended as a refutation of the development theory; *Philosophy of Scepticism and Ultraism* (1857); *The Philosophy of the Divine Operation in the Redemption of Man* (London, 1862); and *The Living Questions of the Age* (Chicago, 1869). D. at Wheaton, Ill., Mar. 6, 1887. Revised by GEORGE P. FISHER.

Walker, JOHN: dictionary-maker; b. at Colney Hatch, near London, England, Mar. 18, 1732; was in early life engaged in mercantile pursuits, and was subsequently an actor; established in 1767 a school at Kensington, and from 1769 devoted himself to lecturing on elocution in England, Scotland, and Ireland, a profession in which he achieved great success. Author of a *Rhyming Dictionary* (1775); *Elements of Elocution* (1781); *Rhetorical Grammar* (1785); and of a *Critical Pronouncing Dictionary and Expositor of the English Language* (1791), which was long the standard work of its class. D. in London, Aug. 1, 1807.

Walker, JOHN BAYLDON: See the Appendix.

Walker, JOHN GRIMES: U. S. naval officer; b. Mar. 20, 1835, at Hillsboro, N. H.; graduated at the Naval Academy in 1856; during the civil war served on the Atlantic coast blockade in 1861, and was transferred to the western Gulf blockading squadron in 1862; served with distinguished gallantry at the taking of New Orleans and Vicksburg, and in almost all the battles on the Mississippi river and its tributaries during the years 1862 and 1863, and commanded the gunboat Shawmut at the taking of Wilmington, N. C., in 1865. He was secretary of the lighthouse board 1873–78; chief of bureau of navigation Oct. 22, 1881–89; commanding South Atlantic station, with rank of acting rear-admiral 1889–93; rear-admiral and president of the naval retiring board in Washington in 1895; retired Mar. 20, 1897.

Walker, LEROY POPE: lawyer and soldier; b. near Huntsville, Ala., July 8, 1817; became a lawyer; early entered public life; was speaker of the Alabama House 1847–50; a judge of the State circuit court 1850–53; became a prominent advocate of the internal improvement of the State and of the policy of secession; was Confederate secretary of war 1861–62; served afterward as a Confederate brigadier-general, and after the civil war resumed legal practice at Huntsville, Ala., where he died Aug. 22, 1884.

Walker, ROBERT JAMES: statesman; b. at Northumberland, Pa., July 19, 1801; graduated at the University of Pennsylvania in 1819 with the highest honors, and in 1821 was admitted to the bar at Pittsburg; entered upon political life as a Democrat; in 1826 removed to Natchez, Miss., where he practiced law. He opposed the nullification movement of South Carolina, and, heading the opposition to Hon. George Poindexter, was in 1836 elected to the U. S.

Senate; and in that year brought forward, without success, the first Homestead Bill. In the Senate he at once took a prominent position. In 1837 he brought forward and carried through the resolution recognizing the independence of Texas, and in the same year he ably advocated the Independent Treasury Bill. In 1841 he originated the Pre-emption Act. In 1844 he published a cogent letter in favor of the "reannexation" of Texas, but recommended the gradual emancipation of slaves as a condition of her admission as a State. In 1845 he was appointed Secretary of the Treasury, an office which he filled with distinguished ability until 1849. The revenue tariff of 1846, the warehouse system, the independent treasury, and the establishment of the Department of the Interior were measures proposed by him. In 1857–58 he was, by appointment of President Buchanan, Governor of Kansas at a most difficult crisis, and was soon at variance with the administration over its policy toward Kansas. He opposed the Lecompton constitution and resigned his office. On the breaking out of the civil war he sustained the Federal Government, and in 1863–64 was financial agent of the U. S. in Europe, negotiating the sale of $250,000,000 in Government bonds. In the latter part of his life he was successfully engaged in the practice of law at Washington, D. C., where he died Nov. 11, 1869.

Revised by F. M. Colby.

Walker, Sears Cook: astronomer; b. at Wilmington, Mass., Mar. 28, 1805; graduated at Harvard 1825; taught school in Boston and Philadelphia 1828–36; founded the observatory of the Philadelphia High School 1837; was actuary to an insurance company in Philadelphia 1836–45; was employed at the Washington observatory 1845–47, where he took a leading part in inventing the electro-chronograph and applying the telegraph to the determination of longitudes; investigated the orbit of Neptune and identified that planet with a star discovered by Lalande in May, 1795, and had charge of the longitude department of the Coast Survey from 1847 to his death, at Cincinnati, Jan. 30, 1853. His most important scientific works were published by the Smithsonian Institution, or in the *Transactions and Proceedings* of the American Philosophical Society and in Gould's *Astronomical Journal*. Revised by S. Newcomb.

Walker, William: filibuster; b. at Nashville, Tenn., May 8, 1824. He studied medicine in Europe, and practiced for a short time in Philadelphia; subsequently he was admitted to the bar, and resided for several years at New Orleans, where he was connected with the *Crescent* journal. In 1850 he went to California, where he settled at Marysville as a lawyer and editor. In July, 1853, he organized an expedition for the conquest of Northwestern Mexico, where he proposed to found a Pacific Republic. Eluding the vigilance of the authorities, he sailed from San Francisco in October, and landed in Lower California with 170 men. There he proclaimed himself president of the new republic; but a strong Mexican force was sent against him. The party suffered great hardships in attempting to make its way overland to Sonora, and he finally crossed the frontier and surrendered to the commander of the U. S. forces at San Diego. He was tried in San Francisco for violation of the neutrality laws but was acquitted. In 1855, on the invitation of some American adventurers in Nicaragua, he agreed to join the democratic faction, which was carrying on a civil war in that country, his ultimate object being to establish an independent government under his own control. He landed on the Pacific coast of Nicaragua with fifty-eight men, and was at first repulsed, but, aided by numerous malcontents and by parties of filibusters who came to his aid, he eventually defeated Gen. Guardiola at La Virgen (Sept. 3, 1855), and soon after occupied Granada, the capital. Corral, his principal opponent, was forced to treat with him in October, and Walker acknowledged Rivas as president, but with the nominal title of commander-in-chief he really retained all the power. Within a few days he accused Corral of corresponding with the legitimists, and the unfortunate man was found guilty by a court martial and shot. Being now master of a great part of the country, Walker proclaimed himself a candidate for the presidency, and all opposition being suppressed, he was elected. Practically he was dictator, and though some of his acts were wise, many of them were arbitrary and tyrannical; among other decrees he issued one restoring slavery. But all Central America was now roused against the invaders. Costa Rica sent a force to aid the legitimists, and her example was soon followed by the other states. From July, 1856, Walker was repeatedly defeated. In Jan., 1857, he abandoned Granada, after setting the town on fire; on May 1, 1857, he took refuge on a U. S. vessel, and was landed at Panama. He made two other attempts to invade Nicaragua, but was prevented from doing so by the interposition of the U. S. authorities. In June, 1860, he invaded Honduras with the intention of fomenting a revolution, but he met with a vigorous resistance, was eventually forced to surrender to the commander of the British vessel Icarus, was by him turned over to the government of Honduras, and was tried and shot at Trujillo, Sept. 12, 1860. He published *The War in Nicaragua* (Mobile, 1860), a work showing considerable literary ability. See also Wells, *Walker's Expedition to Nicaragua* (1856); H. H. Bancroft, *History of Central America*, vol. iii. (1887). Herbert H. Smith.

Walker, William Sidney: author; b. at Pembroke, Wales, Dec. 4, 1795; educated at Eton and at Trinity College, Cambridge; graduated in 1819; was fellow at Trinity 1822–29, during which period he became blind; afterward gained a scanty subsistence by his pen in London, where, after years of suffering from strange hallucinations due to a painful disease, he died Oct. 15, 1846. At the age of seventeen Walker published an epic poem, *Gustavus Vasa* (1813); translated while an undergraduate *Poems from the Danish* (1816); subsequently edited a *Corpus Poetarum Latinorum* (Cambridge and London, 1827; new ed. 1854); and left in MSS. *Shakspeare's Versification* (1852; 3d ed. 1859), and *A Critical Examination of the Text of Shakspeare, etc.* (3 vols., 1859), both edited by W. N. Lettsom. See his *Poetical Remains, with a Memoir*, edited by Moultrie (1852).

Revised by H. A. Beers.

Walkerton: town; capital of Bruce County, Ontario, Canada; on Saugeen river, 30 miles from Saugeen (Southampton), and on the Wellington, Grey, and Bruce branch of the Grand Trunk Railway (see map of Ontario, ref. 3–B). It is in an agricultural region, and has three weekly newspapers, important manufactories, an active trade, and a considerable water-power afforded by the river. Pop. (1881) 2,604; (1891) 3,061.

Walkerville: village; Essex County, Ontario, Canada; on the left bank of the Detroit river, opposite Detroit and adjoining Windsor on the N.; and on the Grand Trunk and the Lake Erie and Det. Riv. railways (see map of Ontario, ref. 6–A). It has large distilleries and storage warehouses, the latter containing 4,000,000 gal.

Walking: See Gaits.

Walking-leaf: the *Camptosorus rhizophyllus*, a curious fern found in the northern and middle parts of the U. S. It derives both its common and its scientific name from the peculiarity of propagating by touching the ground with the tips of its leaves, where they take root and give origin to new plants. Revised by Charles E. Bessey.

Walking-stick: any one of several orthopterous insects, which with their long bodies and protective coloration closely resemble the green or dry twigs among which they live. Their motions are slow, the wings rudimentary or lacking, and they owe their safety from the attacks of enemies to their mimicry of other objects. One common species, *Diapheromera femorata*, which lives on the oak, is about 3 inches in length, but in the tropics there are species 8 or 10 inches long. J. S. K.

Wal'laby [the Australian name]: any kangaroo of the genus *Halmaturus*. Wallabies are of moderate size, ranging up to 50 lb. in weight. The upper incisors of the third pair are comparatively elongate, and have rather narrow crowns and deep grooves, and the premolars are well developed and mostly persistent through life. The wallabies mostly "have a bridle-mark behind the shoulder and a horizontal stripe across the haunch." They are chiefly nocturnal in their habits. The largest species live in Tasmania; the smallest are found in New South Wales and in West Australia. Revised by F. A. Lucas.

Wallace, Alfred Russel, LL. D.: naturalist; b. at Usk, Monmouthshire, England, Jan. 8, 1822; educated at the grammar school of Hertford; was articled to an elder brother as land-surveyor and architect; abandoned that profession to devote himself to natural history; undertook in 1848, with Henry W. Bates, an exploration of Northern Brazil; resided some months at Pará; explored the Amazon and Negro rivers; obtained numerous vocabularies of Indian tribes, and made extensive collections in ornithology and botany, which were mostly lost at sea; returned to

England 1852; published *Travels on the Amazon and Rio Negro, with Remarks on the Vocabularies of the Amazonian Languages* (1853), aided in the linguistic part by Robert G. Latham, and *Palm Trees of the Amazon* (1853); spent eight years in exploring the islands of the East Indies, especially the Moluccas, Celebes, and New Guinea. He arrived, independently of Darwin's researches, at a theory of natural selection, which he embodied in a paper, *On the Tendency of Varieties to depart indefinitely from the Original Type*, read before the Linnæan Society July 1, 1858, simultaneously with Darwin's paper *On the Tendency of Species to form Varieties*, etc., being the first public announcement of the so-called Darwinian theory. In 1862 he brought from the East Indies more than 8,000 birds and more than 100,000 entomological specimens; was occupied for several years in the study and classification of his vast collections; published *The Malay Archipelago* (2 vols., 1869) and *Contributions to the Theory of Natural Selection* (1870); was awarded in 1868 the medal of the Royal Society, and in 1870 the gold medal of the Geographical Society of Paris. Wallace has become noted for his investigations of spiritualism, in which he is a believer, as shown by his *Miracles and Modern Spiritualism* (1875). In 1876 he issued, simultaneously in English, French, and German, his work *On the Geographical Distribution of Animals* (2 vols.). In 1880 followed *Island Life*, in 1882 *Land Nationalization*, in 1889 *Darwinism*, and in 1893 *Australia and New Zealand*. He has also published many papers in scientific periodicals. Revised by J. S. Kingsley.

Wallace, Horace Binney: author and law editor; b. in Philadelphia, Pa., Feb. 26, 1817; was the youngest son of John Bradford Wallace; studied for two years at the University of Pennsylvania; graduated at Princeton 1835; studied medicine, chemistry, and law, but never adopted a profession; contributed largely to literary periodicals; published anonymously a novel, *Stanley, or the Recollections of a Man of the World* (1838); edited, in conjunction with Judge Hare, *American Leading Cases in Law* (2 vols., 1847; 3d ed. 1852); Smith's *Leading Cases* (4th Amer. ed., 2 vols., 1852); and White and Tudor's *Leading Cases in Equity* (2d Amer. ed., 3 vols., 1852), all copiously annotated; aided Rufus W. Griswold in his *Napoleon and the Marshals of the Empire* (2 vols., 1847); traveled in Europe 1849–50 and again 1852, giving assiduous study to philosophical problems. In a fit of insanity resulting indirectly from overwork he committed suicide in Paris, Dec. 16, 1852. Two posthumous volumes of his miscellaneous writings were published—*Art and Scenery in Europe, with other Papers* (1855) and *Literary Criticisms and other Papers* (1856). Revised by F. Sturges Allen.

Wallace, Sir James: naval officer; b. in Great Britain about 1730; became post-captain in the navy 1771; commanded the fleet on the Newport station 1775, and conducted the naval expedition up the Hudson river Oct., 1777, when Kingston was destroyed and several other towns laid waste; was captured in the Experiment by d'Estaing Sept. 24, 1779; commanded the Warrior in Rodney's victory over De Grasse, Apr. 12, 1782; was governor of Newfoundland 1793–95; became rear-admiral 1794, vice-admiral 1795, and rear-admiral of the blue Jan. 1, 1801. D. in London, Mar. 6, 1803.

Wallace, Lewis: lawyer, soldier, and author; son of David Wallace (1799–1859), jurist; b. at Brookville, Franklin co., Indiana, Apr. 10, 1827; served as lieutenant in the Mexican war, 1846–47; then studied law, which he practiced till Apr., 1861, when he was appointed adjutant-general of Indiana. In three days he organized six regiments —the quota of the State under the first call for troops—and was appointed colonel of the Eleventh Indiana. He served in West Virginia, where he defeated the Confederates at Romney. The regiment re-enlisted on completion of its term, and he continued as its colonel. He was commissioned brigadier-general of volunteers on Sept. 3, and stationed in Kentucky. He commanded a division in the taking of Fort Donelson, Feb. 16, 1862; in recognition of his services on that occasion was appointed major-general of volunteers (Mar. 21). In the succeeding battle of Shiloh (Apr. 6–7) his division was not engaged during the first day's fighting, but on the second day he led the attack and took part in the subsequent advance on Corinth. He saved Cincinnati from capture by Gen. Kirby Smith (Sept., 1862), and was subsequently president of the court to investigate the conduct of Gen. Buell (Nov., 1862). In 1864 he commanded the middle department and Eighth Corps, and by the desperate battle of Monocacy (July 9) prevented the capture of Washington and Baltimore by Gen. Jubal Early. He was a member of the commission which tried the assassins of President Lincoln, and in the same year president of the commission which tried Capt. Wirz, commandant of Andersonville prison. In 1866 he was sent to Mexico on a secret diplomatic mission to President Juarez; was appointed governor of New Mexico, 1880; and was U. S. minister to Turkey in 1881–85. When not engaged in public service, Gen. Wallace has practiced law, and devoted himself to literature. He published *The Fair God* (Boston, 1873); *Ben-Hur, a Tale of the Christ* (New York, 1880); *The Life of Gen. Benjamin Harrison* (Philadelphia, 1888); *Commodus, a Tragedy* (New York, 1889); *The Boyhood of Christ* (New York, 1889); and *The Prince of India* (New York, 1893). Already a larger number of copies of *Ben-Hur* have been circulated than of any other American romance except *Uncle Tom's Cabin*.—His wife, Mrs. Susan Arnold (*Elston*) Wallace, is also a writer. Among her published works are *The Storied Sea* (Boston, 1883); *Ginevra, or the Old Oak Chest* (New York, 1886); *The Land of the Pueblos* (1888); and *The Repose in Egypt* (1888). She has also contributed to periodicals and reviews. Edwin A. Grosvenor.

Wallace, Robert: See the Appendix.

Wallace, Sir William: patriot; b. in Scotland about 1270; younger son of Sir Malcolm Wallace of Elderslie, Renfrewshire. The early part of his life is involved in obscurity; the story of his flight after killing a fellow student in Dundee is doubtful, but it is probable that he had done something to anger the English, and was thus driven to armed resistance. He first appears in authentic history in 1297 as leader of a large band of insurgents against the authority of the English king, Edward I., who claimed the throne of Scotland. Emboldened by the success of several preliminary skirmishes, he attacked the town of Scone, where an English justiciary was holding court, and killed or captured many of the English. Edward thereupon sent into Scotland a considerable force under the command of Sir Henry Percy and Sir Robert Clifford, who successfully repulsed a night attack made by Wallace near Lochnaber, and drove him back into Ayrshire, and received, by a treaty at Irvine, the submission of most of the Scottish leaders. Wallace and Sir Andrew Moray alone refused to lay down their arms, and withdrew to the Northern Highlands, where they organized large forces and captured nearly all the English garrisons in Scotland. Edward I. was at this time in Flanders, but his general, John de Warrenne, Earl of Warrenne and Surrey, who in the previous year had been appointed guardian of Scotland, gathered a powerful army and advanced toward Stirling, whereupon Wallace abandoned the siege and marched against him. After a vain attempt at negotiation, Surrey was completely defeated at Stirling Bridge, Sept. 11, 1297, and pursued to Berwick. Wallace passed the border and ravaged Cumberland and Northumberland. On his return, he was recognized in Scotland as guardian of the realm in the name of John Baliol, then a prisoner in the Tower of London. In the following year Edward proceeded to Scotland with a force numbering, according to Scottish accounts, 80,000 infantry and 7,000 cavalry, and gained over Wallace a decisive victory at Falkirk July 22, by which the English rule in Scotland was re-established. From this time little is known of his career except that he led a wandering life, heading occasional forays against the English, and that he visited France. He took part in the Scottish revolt of 1303, though not in any conspicuous capacity; was declared an outlaw on account of his refusal to respect the treaty between Edward and John Comyn, Earl of Badenoch (1304), large rewards being offered for his capture; was betrayed by Sir John Menteith into the hands of the English near Glasgow early in 1305; was taken to London, tried for treason in Westminster Hall, condemned Aug. 23, 1305, and hanged, drawn, and quartered at West Smithfield on the following day. His head was placed above London Bridge and his limbs sent to Newcastle, Berwick, Perth, and Stirling. See J. Stevenson, *Documents Illustrative of Sir William Wallace* (Maitland Club, 1841); A. Brunton, *Sir William Wallace* (Glasgow, 1881); H. Gough, *Scotland in 1298* (Paisley, 1888); J. Moir, *Sir William Wallace* (Aberdeen, 1888). Revised by F. M. Colby.

Wallace, William Harvey Lamb: soldier; b. at Urbana, O., July 8, 1821; removed to Illinois with his father in 1833; studied law, and was admitted to the bar in 1846;

served in the war with Mexico; became district attorney of the ninth Illinois district in 1853; in May, 1861, was appointed colonel Eleventh Illinois Volunteers, and at Fort Donelson (Feb., 1862) commanded a brigade in McClernand's division with ability, and was appointed brigadier-general of volunteers in March. In the succeeding battle of SHILOH (*q. v.*), Wallace commanded Smith's old division, which withstood for nearly six hours the furious assaults of the enemy, and was the last to leave the field, Wallace falling mortally wounded in an ineffectual attempt to resist the enemy. D. at Savannah, Tenn., Apr. 10, 1862.

Wallaceburg: village and port of entry; Kent County, Ontario, Canada; on the Sydenham river and the Erie and Huron Railway; 14 miles N. W. of Chatham (for location, see map of Ontario, ref. 6–B). It has saw and grist mills, tannery, several hotels, and a weekly and a monthly periodical. Pop. (1881) 1,525; (1891) 2,726.

Wallachia: See ROUMANIA.

Wallack, JAMES WILLIAM: actor; b. in London, England, Aug. 24, 1795; son of William Wallack, a comedian and vocalist, and of Elizabeth Field, who for several years played leading women characters with Garrick; made his appearance on the London stage at the age of seven years; was engaged by Sheridan at Drury Lane; played with Edmund Kean in Shakspearean dramas; went to the U. S. 1818; appeared as Macbeth at the Park theater, New York, Sept. 7, 1818; became stage manager at Drury Lane 1820; lived alternately in England and the U. S. for several years; opened in 1837 the National theater, New York, burned down in 1839; established in 1852 Wallack's Lyceum, afterward Wallack's theater, on the corner of Broadway and Broome Street, rebuilt in 1861 at the corner of Broadway and Thirteenth Street, and later located at Broadway and Thirtieth Street. The name of this theater was changed to "Palmer's" in 1888. He was a superior comedian and manager, owing much of his success to his care in the selection of competent supporters and to his regard for artistic proprieties in the details of stage costumes and scenery. D. in New York, Dec. 25, 1864.—His son JOHN LESTER, b. in New York, Jan. 1, 1820, known for some time as J. W. Lester, afterward as Lester Wallack, became proprietor of the theater, maintained its reputation, and adapted some French comedies to the American stage. D. at Stamford, Conn., Sept. 6, 1888. See his *Memoirs of Fifty Years* (New York, 1889). Revised by B. B. VALLENTINE.

Wallaroo': a name given to two species of kangaroos, constituting a section of the genus *Macropus*—viz.: (1) *Macropus antipolinus*, the red wallaroo, and (2) *Macropus robustus*, the black wallaroo; the former inhabits the country about Fort Essington, and the latter the mountain ranges of the coast of New South Wales.

Walla Walla: city; capital of Walla Walla co., Wash.; on the Walla Walla river, and the Wash. and Col. River and the Oregon Railway and Nav. Co.'s railways; 75 miles W. S. W. of Lewiston, Id., and 160 miles E. by N. of The Dalles, Or. (for location, see map of Washington, ref. 7–I). It is in an agricultural, fruit-growing, and stock-raising region, and is the trade center of that part of the State, of Northern Idaho, and of Northeastern Oregon. The name is Indian, meaning "many waters," and was applied to the whole valley because of the numerous springs which flow down the sides of the surrounding mountains. The settlement was originally known as Wailatipa; was incorporated as a town and made the county-seat in 1859, and was incorporated as a city in 1862. It contains Methodist Episcopal churches of both the Northern and Southern branches, Baptist church and a mission, two Presbyterian churches, Advent Christian, Congregational, Lutheran, Protestant Episcopal, and Roman Catholic churches, and Salvation Army barracks. The educational institutions comprise the Baker Public School, Paine High School (building cost $30,000), Advent College, Whitman College (Congregational), Empire Business College, St. Vincent's Academy for girls, and St. Patrick's School for boys. Among the public buildings are those comprising the U. S. military post, Fort Walla Walla, the State penitentiary, and the U. S. penitentiary. The city has excellent water-power, foundry, flour-mills, machine-shops, 2 national banks with combined capital of $200,000, a State bank with capital of $50,000, a savings-bank with capital of $90,000, and 2 daily and 3 weekly newspapers. Pop. (1880) 3,588; (1890) 4,709; (1900) 10,049.
EDITOR OF "STATESMAN."

Wallenstein, *vaăl'len-stīn*, or **Waldstein**, *vaălt'stīn*, ALBRECHT WENZEL EUSEBIUS, von: soldier; b. on the family estate of Hermanitz, Bohemia, Sept. 14, 1583; was educated in the Protestant faith, but came after the death of his parents under the guardianship of his uncle, Albrecht von Slavata, who sent him to the Jesuit Academy of Olmütz, where he was converted to Roman Catholicism. After studying at the Universities of Padua and Bologna, and traveling through Italy, Spain, France, and Holland, he served in Hungary against the Turks in the army of the Emperor Rudolf, under Gen. Basta, and married in 1606 an old widow, by whose death in 1614 he inherited very extensive estates in Moravia. On his uncle's death he became proprietor of one of the largest landed estates in Moravia and Bohemia. In 1616 he organized a regiment of dragoons at his own expense, and hastened to the rescue of the city of Gradisca, which was besieged by the Venetians. The emperor now made him a count, and by his marriage with the daughter of Count Harrach he obtained connections and influence at the court of Vienna. When the revolution which opened the Thirty Years' war broke out in Bohemia in 1618, he sided with the emperor, saved the imperial treasury containing a large sum from falling into the hands of the insurgents, equipped a new regiment of dragoons, and when, after the battle of the Weissemberg—in which, however, he was not present—enormous confiscations took place in Bohemia, he bought of the emperor estates to the value of 7,290,228 florins. In 1623 the emperor created him prince, and in the following year hereditary Duke of Friedland. With his success his ambition increased. In 1625, when the Protestant princes of Northern Germany, under the leadership of Christian IV. of Denmark, and in alliance with Bethlen Gabor, of Transylvania, arose against the emperor, Wallenstein offered to organize an army of 50,000 men and lead it according to the orders of the emperor. After some negotiations the offer was accepted, and in an incredibly short time he actually created an effective army of about 40,000 men. Apr. 25, 1626, he defeated Count Mansfeld, one of the most famous generals of the time, at Dessau, and pursued him through Silesia into Hungary, where this part of the war ended with the dissolution of Mansfeld's army and an advantageous peace with Bethlen Gabor. Returning through Silesia, Wallenstein occupied Brandenburg and Pomerania, expelled the refractory Dukes of Mecklenburg, penetrated through Holstein and Schleswig into Jutland, and compelled Christian IV. to conclude peace. In reward the emperor created him Duke of Mecklenburg in 1629. At this moment his career received a severe check. His army, now numbering about 100,000 men, was supported at the expense of the districts in which it was stationed, and the people complained of the burden that this imposed. Moreover, it was seen that he was possessed with an insatiable ambition, and permitted no scruple to stand in the way of its gratification. In Sept., 1630, he was dismissed and his army dissolved. He retired to his estates in Bohemia, where he lived in royal splendor, occupied with the administration of his vast property, with astrological studies, and with schemes of the most daring ambition. When Gustavus Adolphus appeared successful in Germany, Wallenstein proposed to raise an army and attack the emperor in joint operation with him, but the Swedish king had no confidence in him, and dropped the negotiations. Meanwhile, after the defeat of Tilly and the annihilation of his army, when the Saxons invaded Bohemia and the Swedes penetrated into Bavaria, the situation of the emperor became almost desperate, and the reinstatement of Wallenstein in power seemed almost the only means of escape. Wallenstein received the supreme military authority in Germany, the right of appointing his own officers, the rights of confiscation, amnesty, and pardon—even the right of negotiating peace. But two months after his appointment there was a new army ready for battle. In the spring of 1632 the Saxons were expelled from Bohemia, and Wallenstein occupied a strongly fortified position at Nuremberg in front of the army of Gustavus Adolphus. The attempt of the Swedes to dislodge him (Sept. 3) failed. Both the armies moved into Saxony, and on Nov. 16, 1632, the battle of Lützen took place. Gustavus Adolphus fell, but Wallenstein was defeated. He retreated into Bohemia, and here he remained inactive for over a year, in spite of the entreaties and positive orders of the emperor. He opened negotiations with the Swedes, the Saxon princes, and Richelieu. His plan was by an alliance with these powers to compel the emperor to accept such a peace as they would grant him, and the special goal of his

personal ambition seems to have been the acquisition of the Bohemian crown. At last his intrigues became known to the emperor, who placed Count Gallas in command of the army, and afterward declared Wallenstein a traitor. On Feb. 23, 1634, he fled from his headquarters at Pilsen to seek rescue and support by the Swedish corps which approached under Duke Bernhard, but two days afterward he was assassinated at Eger by some of his officers. His *Letters* have been published by F. Förster in 3 vols. (1828–29), and monographs on his life and character have been written by Förster (1834 and 1844), Aretin (1846), Hurter (1855), Dudik (1858), Fiedler (1860), Ranke (1869), Gindely (1886), and Meyer (1886). See also Schmid, *Die Wallenstein Litteratur* (1878), Schiller's trilogy (*Wallensteins Lager*, *Die Piccolomini*, and *Wallensteins Tod*), and the article THIRTY YEARS' WAR. Revised by F. M. COLBY.

Waller, EDMUND: poet; b. at Coleshill, Hertfordshire, England, Mar. 3, 1606, of an ancient and wealthy family; was first cousin, through his mother, of John Hampden, and distantly related to Cromwell; educated at Eton and at King's College, Cambridge; inherited in boyhood an estate of £3,500 a year; was chosen to Parliament for Agmondesham at the age of nineteen, on the accession of Charles I. (1625), and sat in that body much of the time for sixty years; married in 1631 a London heiress, who soon died; became noted as a writer of elegant and rhythmical verses, most of which were in praise of Sacharissa (Lady Dorothy Sidney) and Amoret (Lady Sophia Murray), to whom he unsuccessfully paid court; married Miss Mary Bresse, by whom he had thirteen children; was appointed after the battle of Edgehill (1642) one of the Parliamentary commissioners to negotiate with the king at Oxford; was gained over by the royalists, and entered into a conspiracy known as "Waller's plot" for the restoration of royal authority; but the plot having been discovered May 31, 1643, he was imprisoned for a year, fined £10,000, and banished the kingdom, only saving his life by abject humiliation before the House of Commons, confessing his guilt and incriminating his companions, three of whom were hanged; spent eight years of exile in France and Italy; was allowed to return about 1653, when he became a favorite with Cromwell, who several times visited his mother (a determined royalist) at Beaconsfield, where Waller now took up his abode. Waller was commonly regarded in the eighteenth century as the first correct versifier, who used the heroic couplet with the smoothness and balance which Dryden and Pope brought to a degree of mechanical regularity. (See *From Shakespere to Pope*, by Edmund Gosse, London, 1885.) He was a general favorite with all parties on account of his wit and eminent social qualities; published a volume of his poems in 1645, and again in 1664, which ran through many editions. D. at Beaconsfield, Oct. 21, 1687. Of the twenty-five or more editions of his poems, the most valued are that of 1711, edited by Bishop Atterbury, and containing two portraits of the poet, and that of 1729, with a *Life* by Fenton and a portrait by Vertue. There are modern *Lives* by Bell (1853) and Gilfillan (1857), accompanying editions of the *Poems*.

Waller, FRANK: See the Appendix.

Waller, THOMAS MCDONALD: lawyer; b. in New York about 1840. Left an orphan in childhood, he became a newsboy; was adopted by a citizen of New London, Conn., whose name he assumed; studied law and was admitted to the bar in 1861; was in the Connecticut Legislature in 1867, 1868, 1872, and 1876, and was speaker in his last term; became Secretary of State in 1870 and mayor of New London in 1873, and was State Attorney in 1876–82. In the latter year he was elected Governor of Connecticut as a Democrat; in 1885 he was appointed U. S. consul-general in London, England, and on the expiration of his term he resumed professional practice.

Waller, Sir WILLIAM: general; b. in Kent, England, in 1597; educated at Magdalen College and Hart Hall, Oxford, and at Paris; served in Germany during the early part of the Thirty Years' war; and on the outbreak of the civil war in England was appointed general and second in command of the Parliamentary forces under the Earl of Essex (1642). He was defeated by the royalists at Lansdowne, near Bath, July 5, 1643, and again at Roundway Down, near Devizes, July 13, but gained a signal victory at Cheriton (or Cherrytown) Down, Alresford, near Winchester, Mar. 29, 1644; was defeated by Charles I. in person at Cropredy Bridge, near Banbury, Oxfordshire, July 29; was deprived of his military command by the "Self-denying Ordinance" Apr., 1645, but continued to be a leader of the Presbyterians in Parliament; was one of the eleven members of Parliament who were impeached of high treason by the army June, 1647, and expelled and twice imprisoned, but was soon readmitted to his seat; was a second time expelled, together with all the Presbyterians, by Col. Pride, Dec., 1648; remained in retirement until the Restoration, when he sat as a member of the council of state Feb., 1660, and of the Convention Parliament Apr. to Dec., 1660. D. at Osterley Park, Middlesex, Sept. 19, 1688. He left in MS. a *Vindication*, published in 1793, and *Divine Meditations*, printed in 1680.

Wall-flower: the *Cheiranthus cheiri*, a European half-shrubby cruciferous plant, often growing on old walls, whence the name. It is a popular garden-flower, having blossoms single or double, of varied colors, and of a rich fragrance. The Western wall-flower, or "yellow phlox" of the U. S., is *Erysimum asperum*, a fine cruciferous plant.

Wallich, NATHANIEL, M. D.: botanist; b. at Copenhagen, Denmark, Jan. 28, 1786; studied medicine; went to India 1807 in the employment of the Danish Government at Serampore; devoted himself to botany, and after the transfer of the Danish possessions to England transferred his services to the East India Company, and was superintendent of the Calcutta botanic garden from 1815 to 1846, when he returned to Europe and settled in London; vice-president of the Linnean Society 1849. He contributed to the *Transactions* of the Asiatic Society of Calcutta and of the Linnean Society, and to Hooker's *Journal of Botany*; added a supplement to Roxbury and Carey's *Flora Indica* (3 vols., 1832); author of *Tentamen Floræ Nepalensis Illustratæ* (Calcutta and Serampore, 1824–26); *A Numerical List of Dried Specimens of Plants in the East India Company's Museum* (1828); and *Plantæ Asiaticæ Rariores* (3 vols., 1830–32), with 300 colored plates. D. in London, Apr. 28, 1854. Revised by CHARLES E. BESSEY.

Wallin, vaăl-leen', JOHAN OLOF: poet; b. in Dalarne, Sweden, Oct. 15, 1779. The son of a poor peasant, his early life was full of hardships. In 1815 his poetical genius, which had developed early, first won general recognition in the didactic poem *Uppfostraren* (The Educator), which received the highest prize of the Academy. Of special interest is his dithyrambic poem to Washington, which is permeated with a warm love for liberty. During the latter part of his life he confined himself wholly to the composition of sacred poetry. To the Swedish hymnal, which was published under his direction (1819), he contributed over a hundred original hymns, besides revising and translating a number of others. He richly deserves the title, conferred on him by Tegnér, of David's Harp of the North. After filling several important positions in the Swedish Church he was consecrated Archbishop of Upsala (1837). D. June 30, 1839. D. K. DODGE.

Wallingford: town (named in 1670); New Haven co., Conn.; on the Quinnipiac river, and the N. Y., N. H. and Hart. Railroad: 12 miles N. of New Haven, 23 miles S. of Hartford (for location, see map of Connecticut, ref. 10–G). It contains the borough of Wallingford and the villages of East Wallingford and Yalesville. The streets of the borough are wide and laid out regularly, many of them lined with stately elms. There are 5 churches, a national bank with capital of $150,000, a savings-bank, and a weekly newspaper. The town has a private and 11 public schools, a grand list of $3,191,959, public debt of $75,000, and rate of taxation, 7 mills. The borough has a grand list of about $2,500,000, a water-works debt of $169,500, other debts $74,320, and rate of taxation, 5 mills. The village of Yalesville, in the northwest part of the town, is on the Quinnipiac river, the N. Y., N. H. and Hart. Railroad, and an electric railway connecting Wallingford borough with Meriden; has 3 churches, and is engaged in the manufacture of piano-stools, augers, edge-tools, and ironware. Wallingford borough is noted for its manufactures of britannia, nickel, sterling silver, silver-plated, and light brass goods, rubber goods, wheels, and ironware. A branch of the ONEIDA COMMUNITY (*q. v.*) was established here in 1850. The State Masonic Home is now established on the old community property. Pop. (1880) town, 4,686; borough, 3,017; (1890) town, 6,584; borough, 4,230; (1900) town, 9,001; borough, 6,737. W. S. RUSSELL, M. D.

Wallingford: town; Rutland co., Vt.; on the Otter creek, and the Bennington and Rutland Railway; 9 miles S. of Rutland, 59 miles S. W. of Montpelier (for location, see map of Vermont, ref. 7–B). It contains the villages of Wallingford, East Wallingford, and South Wallingford, and has

a public high school, several district schools, 4 churches, and 2 hotels. There are manufactures of coffins and caskets, harness, ox-bows, snow-shovels, stoves, tinware, and hay and manure forks. Pop. (1890) 1,733; (1900) 1,575.

Wallis: See VALAIS.

Wallis, JOHN, D. D., F. R. S.: mathematician; b. at Ashford, Kent, England, Nov. 23, 1616; graduated at Cambridge about 1636; became a fellow of Queen's College; took orders in the Church of England 1640; was secretary to the Westminster Assembly of Divines 1644; became Savilian Professor of Geometry at Oxford 1648, and keeper of the archives at Oxford 1658; was one of the founders of the Royal Society 1662; had a controversy with Hobbes, who pretended to have discovered the quadrature of the circle 1655–63; was one of the revisers of the Book of Common Prayer 1661. D. at Oxford, Oct. 28, 1703. He was the author of *Grammatica Linguæ Anglicanæ* (Oxford, 1653; 6th ed. 1765); *Mathesis Universalis* (1657); *Institutio Logicæ ad Communes Usus accommodata* (1687; 5th ed. 1729); and other works, collectively published as *Opera Mathematica et Miscellanea* (Oxford, 3 vols. folio, 1695–99).
Revised by S. M. JACKSON.

Wallkill River: a river which rises in Sussex co., N. J., and flows N. N. E. through Orange and Ulster cos., N. Y., joining the Rondout. It furnishes considerable water-power. The Wallkill valley is a famous dairy region.

Wallon, *vaä'lōń'*, HENRI ALEXANDRE: historian and statesman; b. at Valenciennes, France, Dec. 23, 1812; was educated in the Normal School of Paris, and became Professor of Modern History and Geography at the Sorbonne in 1840; was elected a member of the Legislative Assembly of 1849, but resigned his seat in 1850 on account of restrictions under which the Assembly placed the suffrage; was again elected a member of the National Assembly of 1871, and contributed much to the final establishment of the republic by the famous *amendement Wallon*, which was carried by a majority of one vote Jan. 30, 1875; became Minister of Public Education in 1875, and member of the Senate in 1876. Among his works are *De l'Esclavage dans les Colonies* (1847); *Histoire de l'Esclavage dans l'Antiquité* (3 vols., 1847–48); *Jeanne d'Arc* (2 vols., 1860); *La Vie de Jésus et son nouvel Historien* (1864), against Renan; *Richard II., Episode de la Rivalité de la France et de l'Angleterre* (2 vols., 1864); *La Terreur, Études critiques sur l'Histoire de la Révolution française* (1872); *Saint Louis et son Temps* (1875); *Histoire du Tribunal révolutionnaire de Paris avec le Journal de ses actes* (1880); and *Les Représentants du peuple en mission, etc., 1793–94* (1888–90). Revised by F. M. COLBY.

Walloons' [from O. Fr. *Wallon*, *Gualon* (Dutch, *Walen*); cf. Lat. *Gal'lus*]: the people occupying the tract along the German speech-boundary in the Southern Netherlands, from Dunkirk (Dünkirchen) to Malmedy, more especially in the Ardennes, parts of the French departments of Pas-de-Calais, Nord, and Aisne, Southern Brabant, Hainault, Namur, Liège, Luxemburg (except the German eastern part), and some places around Malmedy in Rhenish Prussia. These people, belonging to the great Gallo-Romanic stock—about 2,250,000 in BELGIUM (*q. v.*)—are descended from the old Gallic Belgæ (with a considerable admixture of Teutons), who in the forests of the Ardennes resisted the barbarous onslaughts of the Germans, mixed themselves with Roman elements, their language becoming Romanized to such an extent that it appears now completely as a French dialect (patois), containing, however, more Germanic and Gallic elements than any other French dialect. Though closely akin to their Gallo-Roman neighbors in France, and though French is the conversational and literary language of the educated Walloons, they have many distinctive traits of their own; they are persevering, patient, and industrious, but at the same time excitable and passionate; the Belgian revolution and the separation of Belgium from Holland is pre-eminently their work. They form the leading element in Belgium, the leading statesmen and men of mark belonging to their nationality. Against this prestige of the Walloons with their French sympathies there is a strong antagonism among the Flemish population, which belongs to the Low German stock; the Flemish movement since 1840 has struggled with success against the suppression of the Flemish language and nationality and its submersion in the French spirit. The first permanent colony that settled in New York and also the first in Brooklyn consisted largely of Walloons. See Grandgagnage, *De l'origine des Wallons* (Liège, 1852); *Dictionnaire étymologique de la langue wallonne* (Liège, 1847–50, continued by Scheler, Brussels, 1880); J. Sigart, *Dictionnaire du Wallon de Mons* (Brussels, 1870); Forir, *Dictionnaire Liégeois-Français* (2 vols., Liège, 1866–74).
HERMANN SCHOENFELD.

Wall-papers: See PAPER-HANGINGS.

Wall-pepper, or **Stonecrop**: a creeping plant (*Sedum acre*) with small, fleshy, acrid-tasting leaves, and yellow, five-petaled flowers, belonging to the family *Crassulaceæ*. It is related to the live-forever (*S. telephium*), house-leek (*Sempervivum tectorum*), *Echeveria*, *Bryophyllum*, and other common succulent plants of conservatories. C. E. B.

Wallsend' [so called from being at the end of Hadrian's wall]: town of England, county of Northumberland; 4 miles N. E. of Newcastle (see map of England, ref. 3–H). It is famous for the excellent coal which is raised in its collieries. Pop. (1891) 11,620.

Walnut [O. Eng. *wealh-hnutu*; *wealh*, foreign + *hnutu*, nut. See WALES]: the common name of trees of the genus *Juglans* (family *Juglandaceæ*), and also of their fruit. In some localities the name is locally extended to the hickories, which are of an allied genus. The English walnut or madeira-nut is the fruit of *Juglans regia*, a stately tree producing excellent timber. The nuts are very good eating, and the kernels yield a fixed drying oil prized by artists and makers of varnishes. In the eastern parts of the U. S. grows the black walnut, *J. nigra*, which yields a very valuable dark-colored timber, used for furniture, joinery, gunstocks, etc. The black walnut produces a strong and very oily nut. The butternut, *J. cinerea*, called also oilnut and white walnut, produces a useful timber. Its nuts are more prized than those of the black walnut, and its inspissated sap, or a decoction of the bark of the root, is a useful cathartic. The Japanese walnut, *J. sieboldiana*, now frequently planted, bears its fruit in long clusters.
Revised by L. H. BAILEY.

Walnut Family: the *Juglandaceæ*, a very small group (thirty-five species) of dicotyledonous trees with monœcious, apetalous flowers, the staminate in catkins, and usually with many stamens, the pistillate usually solitary with a single, inferior, bicarpellary, one-celled ovary, containing a single, erect, orthotropous ovule. The leaves are alternate and pinnately compound, and the young shoots and foliage are usually strong-scented or resinous-aromatic. They are found principally in the northern temperate zone, being about equally divided between North America and Asia. The family is important as yielding valuable timber and edible nuts, the important genera being *Juglans* (the walnuts, of seven or eight species) and *Hicoria* or *Carya* (the hickories, of about ten species, all of North America).
CHARLES E. BESSEY.

Walpole: town (incorporated in 1724); Norfolk co., Mass.; on the N. Y. and New Eng. and the N. Y., N. H. and Hart. railways; 8 miles S. E. of Dedham, 19 miles S. W. of Boston (for location, see map of Massachusetts, ref. 5–I). It contains the villages of Walpole, East Walpole, and South Walpole; has a high school, 13 district schools, public library, 2 weekly newspapers, and 6 churches; and is principally engaged in the manufacture of paper, binder's board, seersucker, clothing, and school furniture. In 1894 the town had an assessed valuation of over $2,000,000. Pop. (1880) 2,494; (1890) 2,604; (1900) 3,572.

Walpole: town (founded about 1745, site granted by Massachusetts in 1735 and by New Hampshire in 1752); Cheshire co., N. H.; on the Connecticut river, and the Fitchburg Railroad; 4 miles below Bellows Falls, 20 miles N. W. of Keene (see map of New Hampshire, ref. 9–C). It is in an agricultural region, is a noted summer resort, and has 5 churches, a high school, 5 graded schools, 16 district schools, a public library with 5,000 volumes, and a weekly newspaper. Pop. (1880) 2,018; (1890) 2,163; (1900) 2,693.

Walpole, Sir CHARLES GEORGE: See the Appendix.

Walpole, HORACE, Fourth Earl of Orford: author; third son of Sir Robert Walpole; b. in London, England, Oct. 5, 1717; educated at Eton and at King's College, Cambridge; received from his father several lucrative sinecures; traveled on the Continent 1739–41, accompanied by the poet Gray, with whom he quarreled at Reggio; had a seat in Parliament 1741–68, but took little part in politics; purchased an estate near Twickenham 1747; was occupied for many years in the erection and decoration of a strange, irregular Gothic

mansion, which he called Strawberry Hill and which he filled with a library and a museum of pictures, armor, antiquities, and miscellaneous objects; set up a private press in 1757, on which, among others, he printed several of his own works; succeeded his nephew as Fourth Earl of Orford 1791, but never took his seat in the House of Lords. D. in London, Mar. 2, 1797. He was never married. He compiled *A Catalogue of the Royal and Noble Authors of England* (1758); *Anecdotes of Painters in England* (1761–71); *Historic Doubts on the Life and Reign of Richard III.* (1768), and other works; wrote *The Castle of Otranto*, a romance (1764); *The Mysterious Mother*, a tragedy (1768); *Memoirs of the Last Ten Years of the Reign of George II.* (1822), and other works, but will be best remembered by his voluminous and interesting letters. His *Entire Correspondence* (9 vols., 1857–59) was edited by Peter Cunningham. See the *Memoirs* edited by Warburton (1852), and Dobson's *Horace Walpole* (1890).

Walpole, Sir Robert, Earl of Orford: premier; b. at Houghton, Norfolk, England, Aug. 26, 1676; educated at Eton and at King's College, Cambridge; was elected to Parliament for Castle Rising 1701, and for King's Lynn 1702; became Secretary at War 1708, and Treasurer of the Navy 1709. Failing to prevent the proceedings against Dr. Sacheverell in 1710, he acted with his fellow Whigs, and was one of the managers for the House of Commons at the impeachment. On the overthrow of the ministry he showed great energy in opposition, and incurred the hatred of the majority in the House. He was found guilty of "a high breach of trust and notorious corruption"; was expelled the House and sent to the Tower Jan. 17, 1712, the condemnation being due to partisan animosity. He was soon released and on the accession of George I. became privy councilor, and afterward paymaster-general of the forces. On the impeachment of Bolingbroke and the late Tory ministers through his efforts, he became Chancellor of the Exchequer and First Lord of the Treasury, with the rank of Prime Minister, Oct. 11, 1715; resigned office in consequence of disunion in the cabinet in Apr., 1717; was the determined enemy of the South Sea scheme; became again paymaster-general in 1720; returned to power as Prime Minister and First Lord of the Treasury in Apr., 1721, and was the virtual ruler of England for the ensuing twenty-one years. During his ministry Great Britain was kept free from foreign complications. Peace and sound finance were the chief aims of his administration. There is no doubt that he was not above the lax morality of the time in the matter of bribe-giving, and that he sometimes maintained his power by this means, but the popular impression of the extent of his personal corruptions was greatly exaggerated. In 1733 he suffered a severe check in his attempt to pass the Excise Bill, and after the death of Queen Caroline his influence began to decline. His fall from power was hastened by his peaceful foreign policy, which provoked sharp attacks by Pitt and the Grenvilles, and lost him the favor of the people. He resigned in Feb., 1742, having been created Earl of Orford two days before. D. at Houghton, Mar. 18, 1745. F. M. Colby.

Walpole, Spencer: historian; b. Feb. 6, 1809; was educated at Eton; was appointed inspector of fisheries in 1867, lieutenant-governor of the Isle of Man in 1882, and secretary to the post-office in 1893. The most important of his works is *A History of England from the Conclusion of the Great War in 1815* (1878–86). He also wrote *The Electorate and the Legislature* (1881); *Life of Lord John Russell* (1889); and *The Land of Home Rule* (1893). D. May 22, 1898.

Walpurgis (*vaal-poor'gis*) **Night**: the evening before May 1, the vigil of the old festival of St. Walpurgis (Walpurga, Walburga; French forms, Gualbourg, Falbourg, Vaubourg, and Avongourg), who died Feb. 25, 779, and is commemorated on that day in some places, but generally on May 1. She was an Englishwoman of the royal blood of Wessex, b. in Sussex, educated at Winburn, Dorset, where she was a nun for twenty-seven years. She then went to Bischofsheim in the diocese of Mentz and established a nunnery (752); after two years (754) she removed to Heidenheim in Bavaria, and became abbess of the Benedictine nunnery of Heidenheim, where was a monastery under her brother, Winebald, in her other brother's (Willibald) diocese. In 760 Winebald died, whereupon she became superintendent, and retained the charge of both monks and nuns until her death. She had a great reputation for sanctity. Her relics were put in a cave at Eichstädt, from which exuded a kind of bituminous oil. This soon got the name Walpurgis oil, and was supposed to have miraculous properties. The cave became a place of pilgrimage. Walpurgis Night is celebrated as the season of the supposed annual celebration of the "witches's sabbath" on the Brocken in the Hartz Mountains. St. Walpurgis had no connection with this ancient superstition, except a partly accidental one. In fact, the old May-day festival was a heathen one, like that of midsummer (which became the feast of St. John), and the traditions with regard to Walpurgis Night have a dim reference to the old heathen practices. The life of St. Walpurgis, written in the ninth century, by Wolfhard, is found in *Acta Sanctorum, O. B.*, ed. Mabillon, iii., 2, 260, *seq.* See Halloween. Revised by S. M. Jackson.

Walrus [from Norweg. *hvalros*, liter., whale horse; *hval*, whale (: Eng. *whale*) + *ros*, horse (: Eng. *horse*)]: the morse, sea-horse, or sea-cow; a pinniped of the family *Odobænidæ*, distinguished by having the upper canines developed as large tusks which point downward. There are two species—one (*Odobænus rosmarus*) inhabiting the northern Atlantic, and the other (*O. obesus*) the northern Pacific. The species attain a large size, old males sometimes reaching, or even exceeding, 12 or 13 feet in length, and their girth is nearly as great; they are therefore very obese, and consequently inefficient on land, but in water their movements are easy and not ungraceful. They swim entirely under water, rising only occasionally to breathe, when they blow somewhat like a whale. The females are smaller than the males, and have much smaller tusks. They feed chiefly upon shellfish—clams, mussels, etc., but also on the bulbous roots of plants which grow in the lagoons and bays. It is chiefly by means of their tusks that they unearth the clams and drag them from their holes. The walrus was first pursued by the Norwegians along the coast of Finmark, then about the shores of Nova Zembla, finally around Spitzbergen and the adjacent islands, where walruses are still found in limited numbers. The fishery is also prosecuted along the coast of Greenland, and as far to the northward as the animals are

The walrus.

to be found. From 1600 to about 1770 the Magdalen islands and other places in the Gulf of St. Lawrence yielded vast numbers of walruses, as many as 1,500 having been killed on one drive, but it has been many years since a walrus has been seen, even on the coast of Labrador. In the Pacific the hunting-grounds are in Bering Sea and the Arctic Ocean, especially on the Asiatic side. The Atlantic walrus-fishery was originally prosecuted from small vessels, and the animals were mostly killed on shore with lances or by shooting; by the Norwegians they were also taken with harpoons from large boats. Vast herds of walruses are no longer found, and at present the walrus-fishery is carried on as a mere adjunct to the whale-fishery, and the animals are either taken with harpoons or shot with rifles while on the ice. This latter method is that almost exclusively followed in the Pacific, where a large share of the walruses taken are killed while the whalers are waiting an opportunity to get north. One or two men, armed with rifles, are landed near a small herd, and it is not uncommon for a skillful hunter to kill from forty to eighty in succession. Walrus-blubber makes a good quality of oil, the tusks are largely used in the manufacture of umbrella-handles, and the hides also are an article of commerce. The walruses, especially those of the Pacific coast, are threatened with extinction. See Odobænidæ. F. A. Lucas.

Wal'sall: town; in Staffordshire, England; 8 miles N.N.W. of Birmingham (see map of England, ref. 9–G). It stands on the border of the South Staffordshire coal-field, and has large brass and iron foundries, and manufactures of cutlery and hardware. Its tanneries, malt-houses, and manufactures of harness and saddlery are also extensive. Walsall returns one member to Parliament. Pop. (1901) 86,440.

Walsh, Robert: journalist; b. at Baltimore, Md., in 1784; educated in the Roman Catholic college at Baltimore and the Jesuit college at Georgetown, D. C.; spent several years in Europe, returning 1809; studied law, but abandoned the profession; became a writer for Dennie's *Portfolio*; published *A Letter on the Genius and Dispositon of the French Government, including a View of the Taxation of the French Empire* (1810), which in six weeks ran through twelve editions in London; conducted from 1811 to 1813 the first quarterly attempted in America, *The American Review of History and Politics*, in which most of the articles were from his pen; issued *Correspondence respecting Russia between R. G. Harper and Robert Walsh, Jr.* (1813), and an *Essay on the Future State of Europe* (1813); wrote biographical prefaces to an edition of the English poets in fifty small volumes, and *An Appeal from the Judgments of Great Britain respecting the United States of America* (1819); conducted *The American Register* (1817–18); *The Museum of Foreign Literature and Science* (1 vol., 1822); *The American Quarterly Review* (22 vols., 1827–37); and *The National Gazette* (1821–37); and published *Didactics: Social, Literary, and Political* (2 vols., 1836), a selection of aphorisms from his newspaper articles and MSS. In 1837 he removed to Paris, where he was U. S. consul during 1845–51, and where he resided until his death Feb. 7, 1859.

Walsh, William Pakenham, D. D.: prelate; b. at Mote Park, County of Roscommon, Ireland, May 4, 1820; had a brilliant career at Trinity College, Dublin; became canon of Christ church, Dublin, 1872; dean of Cashel 1873; and Bishop of Ossory, Ferns, and Leighlin 1878. He has written several books, among them *Christian Missions* (Dublin, 1862); *Heroes of the Mission Field* (London, 1879; 2d ed. 1882); *Modern Heroes of the Mission Fields* (1880; 3d ed. 1888); *Voices of the Psalms* (1889). S. M. J.

Walsingham, Sir Francis: one of Queen Elizabeth's principal Secretaries of State; b. at Chiselhurst, Kent, England, about 1536; studied at King's College, Cambridge; traveled on the Continent, and remained there during the reign of Mary; acquired the favor of Cecil, Lord Burleigh, by his political abilities and his knowledge of foreign languages; was sent three times on missions to the court of France, where he resided 1570–73; was on Cecil's recommendation knighted, sworn of the privy council, and made one of the principal Secretaries of State 1573; was sent on important embassies to the Netherlands 1578, to France 1581, and to Scotland 1583; was a man of strict morals and undoubted integrity, addicted to religious meditation and to the Puritanic party in the state, but displayed as a statesman a consummate craftiness, bordering on duplicity; was said to have had in his pay in foreign countries many agents and spies, through whom he was quickly informed of the secrets even of hostile courts; was an uncompromising political adversary, if not a personal enemy, of Mary Queen of Scots, whom for years he surrounded with spies and informers, who endeavored to inveigle her into real or pretended plots and conspiracies in order to intercept her letters: had in his pay a servant of the French ambassador, Castelnau, and Gray, the envoy of the Duke of Guise to the Scottish court, who was employed in managing the correspondence of Mary and James with their friends in France, thus discovering the so-called "Babington's plot" 1586; was a member of the commission for the trial of the Queen of Scots at Fotheringay Oct., 1586; was charged by her with having forged the correspondence produced against her—a charge which he of course solemnly denied. About this time he was made Chancellor of the Duchy of Lancaster, and soon afterward withdrew from the management of public affairs. He received but a scanty pecuniary reward for his services, and was in debt at the time of his death, which occurred at Barn Elms, near London, Apr. 6, 1590. He was buried in St. Paul's Cathedral. A tolerably full account of Walsingham's French embassy (1570–73) is given in Sir Dudley Digges's *Compleat Ambassador* (folio, 1655). He was the chief patron of Richard Hakluyt in his enterprise of collecting and publishing the voyages and discoveries of the sixteenth century. Revised by F. M. Colby.

Walter, John: journalist; b. in England in 1739; became a printer in London; bought in 1780 two patents issued to Henry Johnson for logography, or the art of using entire words, their radices, and terminations, instead of single letters, in arranging and composing for printing; endeavored to introduce that invention by the establishment of a newspaper, *The London Daily Universal Register*, of which the first number appeared Jan. 18, 1785. Though the system of printing proved a comparative failure, the newspaper itself prospered, especially after a change of title was made to *The Times* (Jan. 1, 1788), and it gradually rose to the rank it now holds as one of the leading periodicals of the world. Mr. Walter acquired a considerable fortune. D. at Teddington, Middlesex, Nov. 16, 1812. His son John (1784–1847) and his grandson John (1818–94) in turn succeeded to the proprietorship of *The Times*.

Walter, Thomas Ustick, LL. D.: architect; b. in Philadelphia, Pa., Sept. 4, 1804; became Professor of Architecture in the Franklin Institute, Philadelphia; designed the Philadelphia county prison 1831, Girard College 1833, the U. S. Capitol extension 1851–65, Treasury building and Government hospital for the insane at Washington. As engineer he designed a breakwater at La Guaira, on the coast of Venezuela, and as consulting architect he was employed upon the public buildings at Philadelphia. He was one of the founders of the American Institute of Architects, and its president for some years. D. in Philadelphia, Oct. 30, 1887.

Walter, William H.: See the Appendix.

Walterboro: town (founded about 1800); capital of Colleton co., S. C.; on the Charleston and Savannah Railway (Plank system); 30 miles W. of Charleston (for location, see map of South Carolina, ref. 7–E). It is in an agricultural region; has Baptist, Methodist Episcopal, Presbyterian, and Protestant Episcopal churches, a graded school, a State bank with capital of $25,000, a loan and savings bank, and two weekly newspapers; and has large naval stores and lumbering interests, dry-kiln and planing-mills, and cotton-mills. Pop. (1880) 691; (1890) 1,171; (1900) 1,491.

Editor of "Press and Standard."

Waltham: city (set off from Watertown and incorporated as a town in 1737; chartered as a city in 1884); Middlesex co., Mass.; on both sides of the Charles river, and on the Boston and Maine and the Fitchburg railways; 10 miles W. of Boston (for location, see map of Massachusetts, ref. 2–H). It is connected by electric railways with Newton and Boston; is compactly built, with two principal streets, a common in the central part, and a fine park in process of construction on the west of the city. There are thirteen churches, representing the Baptist, Roman Catholic, Universalist, Protestant Episcopal, Methodist Episcopal, Presbyterian, Unitarian, Swedenborgian, and Congregational denominations; 57 public day-schools and 3 evening-schools, with an enrollment of 3,328, maintained at an annual cost of $61,255; a parochial school with 1,000 pupils, a Swedenborgian school with 70 pupils, a free public library of 23,000 volumes, a weekly and 3 daily newspapers, and a hospital supported in part by the city. The Massachusetts School for the Feeble-minded is here. Waltham's assessed valuation is $18,766,060; debt, $1,026,508. In 1895 there were a national bank with capital of $150,000, and a savings-bank with deposits of $2,689,232. There are two watch-making works, one, the American Waltham, in which the manufacture of watch-movements on a large scale by machinery was first attempted, being probably the largest in the world; a cotton-mill, erected in 1814, with bleachery and dye-works attached, in which cotton cloths were first made in the U. S. from the raw fiber under one roof; and ten other manufacturing corporations. Pop. (1880) 11,712; (1890) 18,707; (1900) 23,481. W. R. Butler.

Waltham Abbey, or **Waltham Holy Cross**: town of Essex, England; on the river Lea; 13 miles N. by E. of London. It has Government powder mills, and Enfield, where the royal small-arms factories are situated, is in the immediate vicinity of the town. The town took its name from the ancient monastery founded here by Harold Harefoot. Pop. (1891) 6,066.

Walther, Carl Ferdinand Wilhelm, D. D.: theologian; leader of the large body of so-called Missouri Lutherans; b. in Langenchursdorf, Saxony, Oct. 25, 1811; the son, grandson, and great-grandson of Lutheran pastors; studied at Leipzig; pastor at Bräunsdorf, Saxony, 1837; emigrated with a colony of six clergymen and 800 people to America

in Jan., 1839, settling first in Perry co., Mo., and becoming pastor in St. Louis 1841. He founded *Der Lutheraner*, 1844, to which was added in 1855 the theological journal *Lehre und Wehre*; in 1846 he organized the Missouri Synod, which numbered in 1895 344,000 communicants; and was professor in the Theological Seminary at St. Louis from its founding in 1850 until his death, May 7, 1887. His later years were marked by a controversy on predestination that divided the Synodical Conference of the Lutheran Church, in which he was charged with holding Calvinistic principles, a charge which he denied, and which could not be reconciled with the doctrine of the universality of redemption that he taught. Among his works are *Kirche und Amt* (Erlangen, 1852; 3d ed. 1875); *American Lutheran Pastoral Theology* (1872); and numerous volumes of sermons. See biography (*Lebensbild*), by his colleague Martin Günther (St. Louis, 1890); also Brömel, *Homiletische Characterbilder* (Leipzig, 1874). HENRY E. JACOBS.

Walther von der Vogelweide, *vaăl'ter-fōn-dăr-fō'gel-vī-de*: poet and minnesinger; b. about 1170, probably in Austria. He came from a noble but poor family, and learned the art of poetry in Austria, presumably from Reinmar der Alte, the famous minnesinger at the court of Vienna. Walther seems to have remained at Vienna until after the death of Duke Frederick I. in 1198. In Sept., 1197, Emperor Henry VI. had died, and a time of great political confusion ensued. Walther wandered from court to court through various parts of Germany, singing his beautiful love-songs and stirring up the conscience of the nation by his political poems. Despite the prominent part which Walther played in art and politics, he remained a poor wandering minstrel, gaining his livelihood by the favor of his patrons, until finally, in 1220, Emperor Frederick II. granted him a small property, probably near Würzburg. In 1227, when the emperor contemplated his long-delayed crusade, Walther composed his famous *Kreuzlied*, but did not personally participate in the expedition of 1228. He died probably in the same year, and presumably at Würzburg, where a stone is pointed out in the Laurence Garden of the Neumünster as marking his grave. The contemporaries of Walther all praise his greatness, and his fame as the foremost of the mediæval German lyrics has steadily increased. In his poetry, as preserved in the best manuscripts, we may distinguish three periods. During the first of these he shows the influence of Reinmar der Alte; like him, Walther is fond of analyzing his feelings and giving his subjective reflections, though gifted with a far deeper feeling for nature than his teacher. It is, however, a proof of his greatness as a man and as a poet that he felt the unnatural and even immoral basis upon which the artistic minnesong of Reinmar and his predecessors was built, and openly in his songs opposed it. With this strong and manly protest begins the second period in Walther's poetic development. He attacks his former teacher and model, parodies the latter's poems, and ridicules their sentimentality. But Walther was not only a severe critic of his degenerated times; he was also one of its leaders, who in the depth of his soul had discovered new paths which he was eager to point out to his fellow men. Thus matured and in full possession of his great gifts he entered the third and most important period of his life. In order to comprehend the power of his ethical feeling one must study his so-called *Sprüche*, didactic poems which he developed to classic perfection. These are mostly political and religious, and convey the convictions of a true patriot and a Christian of broad human feelings. No man before Luther attacked the pope and the Roman clergy as fearlessly as Walther did. The best and most perfect of his lyric poetry belongs to the last period of his poetic activity. In 1889 a statue was erected to him at Bozen, Tyrol.

BIBLIOGRAPHY.—The best critical edition of Walther's poems is that by K. Lachmann (1827); later editions by Wackernagel and Rieger (1862), Pfeiffer (1864), Wilmanns (1883), and Paul (1882). Of the many translations into modern German the best are by K. Simrock (1833) and Ed. Samhaber (1882). There are biographies by L. Uhland (1822), Menzel (1865), Burdach, *Reinmar der Alte und Walther von der Vogelweide* (1880), Wilmanns (1882), A. Schönbach (1890). See also the article MINNESINGERS.

JULIUS GOEBEL.

Walton: village; Delaware co., N. Y.; on the Delaware river, and the N. Y., Ont. and West. Railway; 17 miles S. W. of Delhi, 180 miles N. W. of New York (for location, see map of New York, ref. 6-H). It is in an agricultural and dairying region, and has 7 churches, high school, union school, 2 banks, 4 hotels, electric lights, 2 water companies, 2 foundries and machine-shops, tannery, baby-carriage factory, novelty manufacturing-works, and 3 weekly newspapers. Pop. (1880) 1,389; (1890) 2,299; (1900) 2,811.

EDITOR OF "REPORTER."

Walton, BRIAN, D. D.: bishop and biblical scholar; b. at Seymour, in Cleveland, Yorkshire, England, 1600; educated at Magdalene College and Peterhouse, Cambridge; was a curate in Suffolk and in London; was successively rector of St. Martin's, Orgar, London, of Sandon, Essex, and of St. Giles-in-the-Fields, London; became prebendary of St. Paul's and chaplain to Charles I. 1639. During the ascendency of the Puritans his livings were sequestrated (1642). He was forced to flee to Oxford, where he devoted ten years during the civil war and the Protectorate to the preparation of his great work, the *Biblia Sacra Polyglotta* (London, 6 vols. folio, 1657), including the Hebrew original of the Old Testament, the Samaritan Pentateuch, the Chaldee, Syriac, Arabic, Persian, and Latin Vulgate, with various readings, notes, etc., constituting one of the chief monuments of Oriental scholarship in England, and still considered "the most complete biblical apparatus in any language." In its preparation Dr. Walton received aid from Archbishop Usher, John Selden, Samuel Clarke, Drs. Edmund Castell, Thomas Hyde, Edward Pocock, and John Lightfoot, and several other noted Orientalists, and for its publication subscriptions to the amount of £9,000 were made. He wrote in 1658 his *Dissertatio* on the antiquity and authority of his texts, usually styled in later editions the *Prolegomena*, and in reply to the attack made by the celebrated Dr. John Owen in his *Vindication of the Purity and Integrity of the Hebrew and Greek Texts, etc.* (1658), wrote his conclusive treatise, *The Considerator considered, etc.* (1659). Walton became chaplain to Charles II. at the Restoration, was consecrated Bishop of Chester Dec. 2, 1660, and took part in the Savoy Conferences 1661. D. in London Nov. 29, 1661. *Memoirs* of his life and writings (2 vols., 1821) were written by Henry John Todd. The *Prolegomena* was republished in the original Latin, edited by Francis Wrangham (2 vols., Cambridge, 1827–28). Revised by S. M. JACKSON.

Walton, GEORGE: signer of the Declaration of Independence; b. in Frederick co., Va., in 1740; was apprenticed to a carpenter; acquired a tolerable education by private study; was admitted to the bar and settled in Savannah, Ga., 1774; was one of the four persons who called the first public meeting at Savannah (July 27, 1774) to concert measures for the defense of that colony; drew up the resolutions passed on that occasion; was a delegate to the Continental Congress 1776–81, and signed the Declaration of Independence and the Articles of Confederation; was colonel of militia in the defense of Savannah Dec., 1778, when he was dangerously wounded, and was a prisoner until Sept., 1779; was chosen Governor of Georgia in Oct., 1779, and again 1789; became chief justice of Georgia 1783, and was U. S. Senator 1795–96. D. at Augusta, Ga., Feb. 2, 1804.

Walton, IZAAK: author; b. at Stafford, England, Aug. 9, 1593; became a linen-draper in Fleet Street, London, 1624, and acquired a competency, upon which he retired in 1644; sympathized with the royalist cause in the great rebellion, and from that time "lived mostly in the families of eminent clergymen of England, of whom he was much beloved," devoting himself to literature, the contemplation of nature, and the pleasures of the fishing-rod. He wrote *Lives* of Dr. John Donne (1640), Sir Henry Wotten (1640), Richard Hooker (1662), George Herbert (1670), and Dr. Robert Sanderson (1678), which have often been published together, and are known collectively as *Walton's Lives*. *The Compleat Angler, or the Contemplative Man's Recreation* (1653), has been many times reprinted, and is one of the best-known works of the seventeenth century, perhaps the quaintest treatise of the pleasures of fishing ever penned, and made specially fascinating by charming descriptions of nature. D. at Winchester, Dec. 15, 1683. He left a son Izaak, who became a clergyman. A *Life of Izaak Walton, including Notices of his Contemporaries* (1823), was published by Thomas Zouch, D. D. Revised by H. A. BEERS.

Waltzeemüller: See WALDSEEMÜLLER.

Walworth, CLARENCE ALPHONSUS: Paulist priest; b. in Plattsburg, N. Y., May 30, 1820; son of Reuben Hyde Walworth; graduated at Union College; studied law, and was admitted to the bar in 1841; practiced law one year, and

then entered the general theological seminary of the Protestant Episcopal Church in New York city; after three years joined the Roman Catholic Church; studied abroad, and later became rector of St. Mary's parish in Albany. He has written *The Gentle Skeptic* (New York, 1860); *The Doctrine of Hell Ventilated in a Discussion between Rev. C. A. Walworth and William H. Burr, Esq.* (1874); besides various poems and essays. He is one of the founders of the Paulist order in the U. S. F. S. A.

Walworth, Jeannette R.: See the Appendix.

Walworth, Reuben Hyde, LL. D.: lawyer and judge; b. at Bozrah, Conn., Oct. 26, 1789; passed his early years on a farm at Hoosick, N. Y.; was for the most part self-educated; was admitted to the bar in 1809; settled at Plattsburg, N. Y.; was an officer of volunteers 1812, and acting adjutant-general of New York militia during the British campaign against Plattsburg 1814; became master in chancery and county judge 1811; took a high position at the bar; in 1823 removed to Saratoga; was a member of Congress 1821–23; was a circuit judge 1823–28; was chancellor of New York 1828–48, taking rank as a master of equity jurisprudence. During the twenty years of his chancellorship he resided in Albany, but upon retiring returned to Saratoga, and acted for some years as chamber counsel and referee, being the referee in the famous "Spike case" of *Burden* vs. *Corning*. During his last years he prepared an elaborate genealogy of his mother's family, *The Hyde Genealogy, or the Descendants, in the Female as well as in the Male Line, from William Hyde of Norwich* (2 vols. 8vo, 1864, with twenty-two steel portraits). On the bench he was somewhat stern, and often anticipated the remarks of counsel. His decisions as circuit judge are in Cowen's *Reports* (9 vols., 1824–30); those pronounced as chancellor are contained in Paige and Barbour's *Reports* (14 vols., 1830–49); and his opinions delivered as an *ex-officio* member of the court for the correction of errors may be found in the *Reports* of Wendell, Hill, and Denio (38 vols., 1829–50). D. at Saratoga, Nov. 21, 1867. Besides the *Genealogy* he was the author of *Rules and Orders of the Court of Chancery of the State of New York* (Albany, 1829). Revised by F. Sturges Allen.

Wame'go: city; Pottawatomie co., Kan.; on the Kansas river, and the Union Pac. Railway; 15 miles E. of Manhattan, 37 miles W. by N. of Topeka, the State capital (for location, see map of Kansas, ref. 5–H). It is in an agricultural region; has a public high school, national bank with capital of $75,000, a private bank, and two weekly newspapers; and is an important grain-market. Pop. (1890) 1,473; (1900) 1,618. Editor of "Kansas Agriculturist."

Wampum [from Amer. Ind., signifying white; cf. Mass. *wómpi*: Del. *wāpe*, white]: the strings and belts of beads used as money by some tribes of North American Indians. The shells of *Venus mercenaria*, the round clam, or quahaug, were the favorite material. These were drilled lengthwise and strung upon a thread. Wampum was either white or of a black or violet-purple color, the last being valued twice as highly as the first. The wampum-belt served not only as money, but as an ornament, and the beads seem to have been used as counters or aids to memory in such simple computations as the Indians made.

Wan'amaker, John: merchant; b. in Philadelphia, Pa., July 11, 1838; engaged in business on his own account in 1861, and became a successful and widely-known merchant of Philadelphia; began mission work there in 1858; founded Bethany Presbyterian church and its great Sunday-school, and became prominent in benevolent and missionary work; was one of the founders of the Christian Commission (*q. v.*); president of the Y. M. C. A. of Philadelphia 1870–83; and U. S. Postmaster-General 1889–93. In 1896 he established himself in New York as the successor of A. T. Stewart.

Wandering Cells: See Histology (*Connective Substances*).

Wandering Jew: the hero of a legend which first appeared in the middle of the thirteenth century in the chronicle of Matthew of Paris, who professes to have received his information from the lips of an Armenian bishop, to whom the Wandering Jew himself had communicated the events. According to this version, he was a servant in the house of Pilate, by the name of Cartaphilus, and gave Christ a blow when he was dragged out of the palace to be executed. According to another version—probably of the fifteenth century and of German origin—he was a shoemaker by the name of Ahasuerus, and refused Christ permission to sit down and rest when, on his way to Golgotha, he passed by his house. All versions, however, agree with respect to the verdict of Christ, that he should remain wandering on the earth until the second coming, and consequently the myth-forming imagination immediately went to work to narrate his travels. Now and then a man appeared who claimed to be the Wandering Jew. Thus in the sixteenth century Ahasuerus was seen in Hamburg and other German cities, and held long conferences with Dr. Paulus von Eitzen, Bishop of Schleswig. In the beginning of the eighteenth century Cartaphilus appeared in London in the higher circles, and communicated to the most learned professors of Oxford, who came to see him, anecdotes from his personal acquaintance with the apostles, Mohammed, Tamerlane, and others. He has figured very largely in works of fiction by Schubart, A. W. Schlegel, Julius Mosen, Lenau, Klingemann, Edgar Quinet, Béranger, Eugène Sue, H. C. Andersen, and other writers of the nineteenth century. See M. D. Conway, *The Wandering Jew* (London, 1881); L. Neubaur, *Die Sage vom ewigen Juden* (Leipzig, 1884). Revised by S. M. Jackson.

Wanderley', João Mauricio: statesman; b. at Barra do São Francisco, Pernambuco, Brazil, Oct. 23, 1815. He studied law at Pernambuco; joined the Conservative party; was elected deputy 1842 and repeatedly re-elected; was senator from 1856, and president of the senate 1882 and 1885. In 1868 he was created Baron of Cotegipe, by which title he is best known. He held portfolios in most of the prominent conservative cabinets from 1854, and was minister to the Platine republics in 1870, signing the treaty of peace with Paraguay. On Feb. 25, 1885, he organized the ministry which carried through congress the general emancipation law; this cabinet remained in power until May 10, 1888. D. at Rio de Janeiro, Feb. 13, 1889. H. H. S.

Wanderoo' [from Cingalese, *wanderu*, monkey]: (1) a monkey of the coast of Malabar (*Macacus silenus*); distinguished by its long hair and venerable appearance, whence it has been also called *Silenus vetus*. The head is oblong and the face rather produced; the hair on each side of the face and on the neck and chest is elongated and forms a sort of ruff round the face, and is of a gray or whitish color; the face about the eyes is naked and flesh-colored; the snout black; the fur is mostly black on the back and sides, and whitish beneath and inside the limbs; the tail is rather short and tufted; it is chiefly brown, but its tuft is whitish. The wanderoo lives in the depth of the forests, and its appearance has given rise to several legends, and to the idea that it is the lord of the monkey race. These monkeys were known to the ancients, and have been supposed to be the "race of men" described by Ctesias as "inhabiting the mountains of India, having heads like dogs, but with larger teeth. They have nails, but larger and more rounded. They bark, but do not talk; they have tails like dogs, but more hairy." The wanderoo attains a length of about 18 inches. (2) The name is also given to, and in fact appears to have been primarily employed for, species of the genus *Semnopithecus*, and especially for the *S. leucoprymnus* of Ceylon. Revised by F. A. Lucas.

Wanklyn, James Alfred, M. R. C. S.: chemist; b. at Ashton-under-Lyne, England, in 1834; received a thorough scientific education; studied chemistry at Heidelberg under Bunsen; made several important discoveries in chemistry, especially in settling the relation of the sugar group to the alcoholic series, and the ammonia process of water-analysis; became demonstrator of chemistry at the University of Edinburgh in 1859; Professor of Chemistry at the London Institution 1863–70; lecturer on chemistry and physics at St. George's Hospital 1877–80; has been public analyst for the county of Buckingham and for several boroughs; in 1871 conducted for the Government the analysis of the milk supplied to the London workhouses. Author of treatises on *Water Analysis* (1868; 7th ed. 1889) and *Milk Analysis* (1873); *On Tea, Coffee, and Cocoa* (1874); *Bread Analysis* (1881); *The Gas Engineer's Chemical Manual* (1886); and of *Air Analysis* (1890). Revised by Ira Remsen.

Wapakone'ta: village (laid out in 1833); capital of Auglaise co., O.; on the Auglaise river, and the Cin., Ham. and Dayton Railroad; 12 miles S. by W. of Lima, 31 miles N. of Piqua (for location, see map of Ohio, ref. 4–D). It is in an agricultural, natural-gas, and petroleum region, and has 2 public-school buildings, county court-house (cost $260,000), 2 national banks with combined capital of $200,000, 3 weekly newspapers, and manufactories of churns, wheels, and

furniture. The site was an ancient Indian capital, was the scene of the signing of the treaty by which the Senecas and Shawnees gave up their lands to the U. S. in 1831, and was the last point in Ohio occupied by the Indians. Pop. (1880) 2,765; (1890) 3,616; (1900) 3,915. EDITOR OF "REPUBLICAN."

Wa'pello: town; capital of Louisa co., Ia.; on the Iowa river, and the Burl., Ced. Rap. and N. Railway; 21 miles S. by W. of Muscatine, 30 miles N. of Burlington (for location, see map of Iowa, ref. 6–K). It is in a grain, vegetable, and fruit-growing and stock-raising region, and has a large public-school building, 4 churches, 2 weekly newspapers, a flour-mill, plow and wagon factories, and fruit and vegetable canneries. Pop. (1880) 928; (1890) 1,009; (1900) 1,398.
EDITOR OF "RECORD."

Wap'iti [from Amer. Ind. (Cree) *wapitik*, liter., white deer; cf. WAMPUM]: the *Cervus canadensis*, or large deer of the Northern U. S. and British provinces. It is more generally called elk, but that name belongs by right to the *Alces malchis*, otherwise called moose. The wapiti is very closely related to the common red deer or stag of Europe, but is a still larger and more noble-looking beast, attaining

The American elk or wapiti.

the dimensions of a moderate-sized horse. The color above and about the lower jaw is yellowish brown; the circles around the eyes brown; the rump has a large pale disk extending far above the base of the tail, with a black streak on each side of it; the tail is very short; the hoofs are broad and semicircular. Such are the chief characters alleged to differentiate the species from the *Cervus elaphus* of Europe. Revised by F. A. LUCAS.

Wappäus, vaăp'pois, JOHANN EDUARD: geographer; b. at Hamburg, Germany, May 17, 1812. He studied at the Universities of Göttingen and Berlin; traveled in the Cape Verde islands and Brazil 1833–34; became a tutor at Göttingen 1838, adjunct professor 1845, and full professor in the same university 1854. His works on geography and history include *Untersuchungen über die geographischen Entdeckungen der Portugiesen unter Heinrich dem Seefahrer* (1842); *Deutsche Auswanderung und Kolonisation* (2 vols., 1846); and *Allgemeine Bevölkerungsstatistik* (2 vols., 1859–61). He is best known for his edition of Stein and Horschelmann's *Handbuch der Geographie und Statistik*, for which he wrote the volumes on Universal Geography (1849), North America (1855), Central and South America (1867), and Brazil (1871). D. at Göttingen, Dec. 16, 1879. H. H. S.

Wappers, GUSTAVE: painter; b. at Antwerp, Belgium, Aug. 23, 1803; studied painting in his native city and in Paris, and attracted general attention in 1830 by his *Devotions of the Burgomasters of Leyden*; became the first representative and the founder of the romantic school of painting in Belgium, and was made director of the Academy of Antwerp in 1840, and a baron in 1847. In 1853 he resigned his position in the academy, and in 1855 removed to Paris, where he died Dec. 6, 1874. Of his pictures, chiefly consisting of historical pieces and portraits, some of the most remarkable are *Charles I. taking Leave of his Children*, *Charles IX. on the Night of St. Bartholomew*, *Execution of Anne Boleyn*, *Defence of Rhodes by the Knights of St. John*, for Louis Philippe, now at Versailles; *The Great Fishery of Antwerp*, for Queen Victoria. His influence on the development of Belgian art was very considerable.

Wap'pingers Falls: village: Dutchess co., N. Y.; on the Wappinger creek, and an electric railway connecting the village with Poughkeepsie; 2 miles from the Hudson river (for location, see map of New York, ref. 6–J). It has 6 churches, 2 public schools, a parochial school, public library, print-works (established in 1834), overall and sheeting factory (established in 1871), and a weekly newspaper. Three different steamboat lines make daily landings at New Hamburg, 2 miles distant. Pop. (1890) 3,718; (1900) 3,504.
EDITOR OF "CHRONICLE."

War [O. Eng. *werre*: O. H. Germ. *werra*, strife; cf. Germ. *wirren*, *verwirren*, confuse; Fr. *guerre* is a loan-word from Teutonic]: a contest between different states or between different parties in the same state carried on by force of arms. The history of war is the history of the human race. Civilized men regard it as a great evil, yet some one of the leading nations of the world is nearly always engaged in it; and it may safely be said that the sun never sets upon a world wholly at peace. Its permanence is thoroughly believed in by those who seem most competent to judge, as will become evident by a brief review of the armies of civilized powers.

Review of Existing Armies.—The population of the leading powers, their peace forces, annual expenditure exclusive of interest on public debt, etc., are shown with sufficient approximation in the table inserted below. A standing army drains the resources of a state in two ways—negatively, by withdrawing its numbers from industrial pursuits, and positively, by the expenditure necessary for its support. It is generally supposed that the maximum number of men which any state can keep permanently under arms is about 1 per cent. of its entire population. A glance at the table will show which nations have reached this limit, and which have passed it. Nevertheless, these figures indicate merely the number actually present with their colors in time of peace, and not the number of trained soldiers that can be called upon in time of war. The principal European nations, except Great Britain, are at this time engaged in organizing and arming their entire able-bodied population. The system by which this is done was originated and perfected by Prussia. The other nations have based their organization upon hers, and have not yet completed it. Accordingly, an examination of the Prussian system as applied to the German empire will be most profitable, and will give a good general idea of the others in their present or future condition.

	Population.	Army.	Navy.	Number of men in army and navy.	Per cent. of population.	Total annual expenditure, exclusive of interest on public debt.	Cost of army and navy.	Per cent. of annual expenditure.
Russia	113,354,649	868,672	31,529 (?)	900,201	0·79	$421,344,000	$163,042,000	38·7
France	38,133,385	598,024	43,620	641,644	1·68	437,709,000	185,120,000	42 3
Germany	49,428,470	584,548	21,478	606,026	1·23	259,187,000	127,372,000	49·1
Great Britain	38,104,975	219,400*	83,400	302,800	0·72	334,776,000	171,568,000	51·2
Austria-Hungary	41,231,342	354,252	8,538	362,790	0·88	386,212,000	77,179,000	19·9
United States	62,622,250	27,160	12,656	39,816	0·06	339,684,000	66,382,000	19·5

* This includes about 75,000 men the cost of whom is borne by the Indian exchequer.

The Prussian system is based upon the theory that military service is not a trade or craft, to be followed by a portion of the population, but a duty owed by every male citizen to his country. Only members of the reigning or mediatized princely families are exempt, and *in time of peace* an only son of a widow or chief support of a family, an owner of a factory who would be unable to carry on his business, a sole assistant of a father in business, a property-holder whose

property would suffer, and a student of theology. Every able-bodied man, with these exceptions, between the ages of 20 and 32, forms part of the army. No substitute or exemption by payment is permitted. All others between the ages of 17 and 45 are liable to be called out upon occasions of great emergency, but they are not regularly organized, although they are enrolled; they are called Landsturm. The standing army consists of the active army and the Landwehr. The active army comprises the field army and the reserves. Every man upon reaching the age of 20 must enter the active army, and serve with it seven years; he serves the first three years continuously in the field army, after which he becomes part of the reserves, and is placed on furlough for the remaining four years. While in the reserves he is bound to take part in not more than two manœuvers, neither of which is to exceed eight weeks; he is recalled to active service whenever an increase of the field army becomes necessary. At the expiration of his seven years in the active army he becomes part of the Landwehr, and so continues for five years, when at the age of 32 he is freed from liability to service except as part of the Landsturm. Students of medicine are allowed to enter the army as surgeons, apothecaries, or veterinary surgeons. Educated young men who provide their own equipment and subsistence are required to serve only one year in the field army, and they may postpone entering it until the age of 23, having been examined, however, at the age of 20. This exception is made on the supposition that superior talents render the acquisition of the necessary military training possible in one year. These men furnish most of the officers of the Landwehr.

The whole army, including the Landwehr, is divided into 20 army-corps, 1 of the guards and 19 of the line. The corps of the guards is somewhat larger than the others, and is recruited from the empire at large. Each of the other corps belongs to a particular province, where it is always kept. Thus the First Corps belongs to the province of Prussia, and the Fifteenth and Sixteenth to Alsace-Lorraine. The corps never leaves its province except for war, and then it draws all its re-enforcements and recruits from it. These provinces are subdivided to correspond with the subdivisions of the army itself. Each corps in time of peace consists of 2 divisions; each division of 2 brigades of infantry and 1 of cavalry; each brigade of 2 to 4 regiments; each regiment of 3 battalions; each battalion of 4 companies; each company of 129 men. There are attached to each corps also 1 battalion of rifles, 1 battalion of pioneers, 1 battalion of military train, and 1 brigade of artillery. Each army-corps district is divided into 4 brigade districts, corresponding to its 4 infantry brigades. Each brigade district is divided into Landwehr battalion districts, and these again into company or levying districts. In the states which are divided into circles each company district is composed of 1 circle, and in general the districts coincide with the civil divisions. Each regiment of the line receives its recruits from its own district, in which it is quartered and from which it is rarely moved; it has a reserve battalion, consisting of men who have served in its own ranks, upon which it relies to increase its strength to a war-footing. It also has its own Landwehr battalions attached to it, bearing the same number and provincial designation. As before stated, the Landwehr and reserve battalions are not kept under arms; the reserves are on furlough, and the Landwehr is something like the militia of the U. S. Generally there are 2 Landwehr battalions to each regiment of the line. Each of these Landwehr battalion districts is provided with a permanent staff, consisting of 1 commander, 1 adjutant, 2 sergeants, 3 corporals, and 6 men as orderlies, with 1 sergeant and 1 corporal for each company district. It is the duty of this staff to keep the necessary clothing and equipments, and to have everything prepared in time of peace for the formation of the Landwehr battalions. Dépôts and magazines of arms and equipments for soldiers of the Landwehr are established at the headquarters of the Landwehr battalion districts. Those of the reserves are at the headquarters of the regiments of the line.

The field army in time of peace is always ready to take the field. It consists of 479,229 enlisted men. A part of this number, the non-commissioned officers, are encouraged to remain, but the greater portion, probably 90 per cent., is renewed every three years, and about 30 per cent. every year. The number of young men who reach the age of twenty each year is rather more than sufficient to recruit this force. Selection is made by lot, those not chosen being then considered as a special reserve, called the restoration (*ersatz*) reserve. The latter includes also those men who have claimed exemption on account of family circumstances, and those who have been exempted on account of slight bodily defects. The mobilization of the army, or placing it on a war-footing, consists of filling up the field troops to their war-strength, and the formation of dépôt troops and of garrison troops. The field troops are placed on a war-footing by increasing the strength of the regiments. For this purpose each infantry regiment calls in about 500 reserves per battalion; this absorbs most of the reserves, and what are left are employed as dépôt troops. Each cavalry regiment calls in about 40 reserves, the peace-strength of cavalry being nearly as great as the war-strength. The field artillery calls in all the reserves and many of the Landwehr. The dépôt troops are intended for filling up vacancies as they occur in the field army. In a year of war the infantry loses 40 per cent., and the cavalry, artillery, and pioneers 20 per cent., of their strength. Each infantry regiment forms a fourth battalion, which it leaves behind as a dépôt battalion; each cavalry regiment leaves a dépôt squadron; each field artillery regiment a dépôt division of four batteries; and each pioneer battalion a dépôt company. As soon as a regiment has lost one-tenth of its men, it calls for that number from its dépôt, and receives them thoroughly prepared for the field. Their places at the dépôt are at once filled by recruiting from the *ersatz* reserve, and, when that is exhausted, from the youngest men of the Landwehr. Should the fourth battalion be required to join the army, a fifth battalion is formed for the dépôt from the Landwehr. The troops required for the garrisons and for guarding the lines of communication are taken from among the Landwehr.

The officers of the field army are permanent, and are usually taken from the aristocratic class. Officers of the reserve are appointed from among officers who have left the field service, or from among very meritorious soldiers whose active service has expired. Officers of the Landwehr are obtained by transfer from the reserve and by promotion from the ranks. At the mobilization some officers of the field army are always transferred to each infantry and cavalry regiment of Landwehr, and each company receives two or three non-commissioned officers from the line.

By this system Germany can now put into the field within two weeks over 1,700,000 men, about 1,000,000 of whom are in the highest state of instruction and discipline, and the balance are inferior only from being out of practice. Including the entire Landwehr and reserves, this total is increased to nearly 2,500,000 men, with about 1,800,000 men of the Landsturm in addition who have received military instruction and are well qualified for local defense. For the manner in which this force can be applied see FRANCO-GERMAN WAR.

The people of the U. S. and Great Britain resemble each other in their jealousy of large standing armies and their abhorrence of a system of universal service, as well as in their warlike spirit and self-sacrificing patriotism. Their military systems are explained in the article MILITIA. The result of such systems is that the army, having to compete with other employments for its recruits, is in time of peace much more expensive per man than that of continental powers, while the cost of carrying on war is enormously greater. It is safe to say that the civil war in North America cost the U. S. double what it would, had it had such an organization as Germany. The chance of a collision between the U. S. and a power so prepared is very remote, but not so with Great Britain. What would be the result of such a collision is a question which causes some anxiety to the friends of the latter.

The natural result of a perfect preparation for war is a less reluctance to enter upon it. Fortunately, these great preparations carry with them a restraining influence—viz., the increased cost of war. We have considered only the organization of the men or the scale upon which modern war is waged, but all the implements of war (see ARTILLERY, SMALL-ARMS, MAGAZINE-GUNS, MACHINE AND RAPID-FIRE GUNS, etc.) have increased in efficiency and expense in full proportion to the perfection of organization. The wars of Napoleon in thirteen years (1802–15) cost France about $1,000,000,000. The civil war in North America cost the U. S. Government in four years about $4,000,000,000, or thirteen times as much a year as Napoleon's, or, allowing one-half of the expense for waste, it cost more than six times as much a year as Napoleon's wars. The work of

war is therefore accomplished in less time, and although the total amount of damage that nations inflict upon each other is probably about the same as formerly, there are more years of peace.

Art of War.—The art of war consists of rules for raising, arming, organizing, recruiting, administering, feeding, and fighting armies in the most efficient and economical manner. It includes, therefore, the fabrication and perfection of arms and equipments, the construction of fortifications, the establishment of military institutions, and the preparation of the soldier for duties in the field. These are the preparations for war, and have been more or less fully treated in the articles ARMY; ARTILLERY; BRIDGES, MILITARY; CAVALRY; ENGINEERS, CORPS OF; FORTIFICATION; INFANTRY; MILITARY ACADEMIES; MILITIA; SAPPERS, MINERS, AND PONTONIERS; SMALL-ARMS; TORPEDOES; etc. We are here concerned with war itself, or the actual employment of armed forces. Some of its details are touched upon in BOMBARDMENT; ESCALADE; ENGINEERING, MILITARY; SIEGE; TACTICS, etc.

The problem is to direct and estimate the effect of forces the energies of which are only partially known, and the resistances to which are known still less. The data for its solution are obtained from military history. Although it is not possible to establish rules to fit every case, nevertheless certain general principles underlie the operations of war, and these give rise to rules which are useful for pointing out the errors to be avoided, if for nothing else. These fundamental principles are—(1) that to insure success the heaviest force must be brought to bear upon the weakest point of the enemy; and (2) that this force must act with the greatest possible velocity. It was one of Napoleon's maxims that the force of an army, like the quantity of motion in mechanics, is measured by the mass multiplied by the velocity.

An army in the field has constant wants which can not be supplied from the enemy's country, such as ammunition, arms, recruits, medical stores, etc., and frequently also food and forage. It is essential to its existence that it should keep open communication with some part of its own country. That part immediately in rear of the army and covered by it is generally selected, and here are collected special dépôts for supplies. This strip of territory is the foundation of the army, or, as it is technically called, its *base*. The roads leading from the position of an army to its base are called *lines of communication*, or, simply, *communications*.

The great aim in war is such destruction of the enemy's military power as will compel him to peace. The defeat and dispersion of his troops is not always sufficient; it must generally be accompanied by the occupation of a portion of his country, thus cutting off his sources of recuperation and his power to raise new armies. And it is evident that such cutting off of resources before the dispersion of his troops will facilitate the latter operation. Accordingly, while the defeat of the enemy's army is the first consideration, effort is generally made at the same time to get possession of some important strategic point, such as his capital or great commercial centers. This point is called the *objective*. The line of direction of the objective from the base is called the *line of operations*. It is not a mathematical line, but it may include several parallel roads not farther apart than one or two days' march when they are employed by the different divisions of the same army. Lines of operation are *simple* when the army is not divided into large independent bodies; *double*, when two armies, either independent or commanded by the same general, proceeding from the same frontier, are widely separated for a long interval of time. Double lines are said to be *interior* when used by one or two armies against several hostile bodies, and having such direction that the masses can be concentrated in less time than the enemy would require to collect a greater force; *exterior*, when the army acts at the same time against both extremities of the enemy; *concentric* or *converging*, when, starting from widely separated points, they meet at the same point; *diverging*, when, leaving a given point, they are directed upon several distinct points. The choice of the line of operations is the most important problem in strategy. The object sought for is to place the army where a victory will be decisive. This will be the case if the enemy's communications are seized, and this object must always be kept in view. At the same time, it must be remembered that the great advantage of the offensive lies in a sudden, unexpected attack—that wide detours are therefore out of place, and the shortest road to the enemy is, other things being equal, the best. In every case, except that of vastly preponderating forces, the line must be directed upon the center or one of the extremities of the enemy, and not upon all at the same time. If the enemy's front is widely extended, the best direction will be upon the center; otherwise, upon one of his flanks, and then upon his rear. The latter may expose the assailant's own communications, and he must take care to preserve a safe line of retreat either to the rear or to the right or left. A single line is preferable to double lines, and the latter are adopted only when the topography of the country makes it necessary, or when double lines have been adopted by the enemy and it has become necessary to oppose each of his masses; and then interior are preferable to exterior lines. In the case of converging lines care must be taken that the junction can be made before the armies are separately exposed to the combined masses of the enemy. When the enemy's forces have been separated, diverging lines may be usefully employed to increase the dispersion; they are then interior lines. All other things being equal, the richest provinces are selected to operate in, as facility of subsistence promotes rapidity of movement. Keeping the army concentrated and giving it a proper direction are not the only requisites for success. There must be no hesitation, no rest. The result of slow and hesitating movements is to find the enemy prepared at all points. No time must be lost in opening the campaign, and when a success is obtained it must be followed up with energy. Fortifications must be observed by detachments, and must not be allowed to check the main advance.

In presenting these simple rules of strategy the offensive has been principally considered, because that is the normal characteristic of war, and is the positive side of it. The defensive is the result of necessity, and is therefore negative. It is generally acknowledged that politically a defensive war is the only legitimate one, but a war politically defensive is not necessarily conducted by defensive campaigns. The offensive preserves the assailant's country from devastation and raises the *morale* of his army, while it is the direct road to the object of the war—viz., the destruction of the enemy's military power. On the other hand, the defensive has the advantage of fortifications, knowledge of the country, and facilities for obtaining information of the enemy's movements; and it is frequently assumed at the beginning of a campaign with a view to taking up the offensive as soon as the enemy shall have expended a part of his strength. As a rule, however, it is employed only in case of reverses or decided inferiority, and then it must not be passive. Minor points are neglected to concentrate upon the decisive ones. Fortifications being intended to occupy a considerable part of the enemy's army in their capture, advantage must be taken of this time to beat the other part. Accordingly, the fortifications with their defenders are left to draw off such portions of the enemy's force as they can, and battle is offered at a distance in rear, and not in front of them. Every effort must be made to strike the enemy's communications and compel him to retreat. "Retreats," says Napoleon, "cost many more men and much more material than the bloodiest battles, with this difference—that in a battle the enemy loses nearly as much, while in a retreat the loss is all on one side." But a simple repulse is not sufficient; for unless the blow is returned, the enemy may renew it, and the war being thus carried on at the expense of the defenders, they will in the end succumb.

The fundamental principles of war, concentration upon the decisive point and velocity, apply to battles (see TACTICS) as well as to strategy, but the resulting rules are modified by the differing circumstances, as one deals with the theater of operations and the other with a battle-field. Good strategy attempts to place the force in the midst of the enemy's masses, but this does not place it in immediate contact with all of them; while in tactics it probably would, on account of the shorter distances involved and the difficulties of preserving secrecy. Hence in the offensive battle effort is made to overwhelm only one wing at a time. The main force is concentrated upon this effort, while a few troops are employed to occupy the enemy at other points. A great success can be obtained only by depriving the enemy of his line of retreat. This can be attained by attacking his flank or his rear, but the first consideration is to beat him, for a vigorous pursuit can change an indecisive victory into a decisive one.

The application of these principles requires a knowledge

of the topography of the country, a perfect familiarity with tactics, and experience in administering and feeding troops. These acquirements are within the reach of men of no extraordinary capacity. There have been many great generals who were not men of learning, or even men with great powers of understanding. The question at once suggests itself, Why is it, then, that there are so few great generals? A glance at some of the difficulties met with at every step in actual campaigning will give the answer. A complete list of them would not be practicable, but the following are given as examples: (1) There are comparatively few men whose minds are not somewhat clouded by the presence of danger; great moral and physical courage are therefore necessary. (2) There is total or partial ignorance of the enemy's condition and intentions, and information is contradictory. The natural anxiety as to the correctness of our conjectures upon these points leads, with an ordinary man, to hesitation and doubt, and these are fatal. Perfect self-reliance and calm adherence to original plans are here demanded. (3) There is nearly always some miscalculation in the difficulties of a road or the strength of a post. Expecting to reach a point at a given time, a commander finds himself a long distance from it. Great energy, strong will, even some severity to obtain the utmost exertions of the troops, are here necessary. (4) The movements of an enterprising enemy call constantly for new combinations, and these must be made and acted on without hesitation. This demands great decision of character. (5) To insure the full support of troops, the general must be able to impress upon them his own spirit. This requires a deep knowledge of men. (6) There is always the element of chance; a sudden rain-storm or a fog may neutralize the greatest efforts.

The following are some of the principal maxims of war, in addition to those already given: (1) Foresee everything that the enemy may do, and provide means to thwart him. (2) The forces employed must be proportionate to the obstacles to be overcome. (3) Debate well at the outset whether to assume the offensive or defensive; but the offensive having been selected, pursue it to the last extremity. The evils of retreats have been referred to above. (4) Be ready to meet the enemy at all hours of the day or night, whether on the march, at a halt, or in camp. (5) With an army inferior in numbers avoid a general battle, and supply the place of numbers by rapidity of marching. (6) The honor of his arms is a general's first consideration, the lives of his men secondary, though the two are entirely consistent with each other, for safety to the whole is found in audacity and persistency. (7) Never do what the enemy wishes you to, for the reason merely that he desires it. (8) When surprised by a superior enemy, a bold attack will generally disconcert him. (9) On the day of battle neglect no chance of success; a battalion sometimes decides the day. O. H. Ernst.

The Modern Laws of War.

The history of the world since 1860 shows clearly that the dreams of peace enthusiasts are not yet realized; that neither arbitration nor any other panacea has been able to avert war. Within this period there have been no less than ten distinct wars between civilized states, contests with barbarous or half-civilized nations without number, and internal conflicts not a few. However much peace may be desired, then, the fact of war is constantly to be faced, so that except to the most visionary it has seemed to promise more practical good to accept this fact of war and try to mitigate the conditions under which it is waged, than to agitate for its entire abolition. Beyond question there is a decided tendency toward a more humane system of war. This means more than the mere fact that wars are less barbarously conducted as regards both persons and property than they formerly were. It implies a change of sentiment in human society which has brought such results to pass. This changed spirit, brought face to face with the slave-trade, the sufferings of the wounded in battle, the horrors of an invasion, human misery of any kind, has a legitimate field to work in. Here is one cause of the growth of milder methods of warfare. Another cause is an economic one. It lies in the appreciation of the frightful waste involved in war. As regards the belligerents, there are costly standing armies lessening production and increasing taxation. In actual war-time there is the destruction of war material and of the property affected, crops, railways, houses, bridges; the waste of productive human life; the diversion of labor from a profitable to a wasteful occupation. The neutral also loses. Now the neutral is the whole commercial world not in arms. His trade is interrupted, his communications broken, his carrying trade cut into, one branch of industry ruined, another perhaps unduly stimulated, both to his loss. Still a third reason is found in the different military system now prescribed by policy. There must be an organized commissariat, a paid soldiery; the fighting is at long range; war is more of a game of skill and less of a hand-to-hand combat.

These two sets of causes, one sentimental in a good sense, the other economic, have worked in corresponding directions to better the treatment of the person and to lessen the destruction of property and interruption of trade. Preserving this natural division of the subject, the first question of interest is as to the treatment of the person by the rules of modern warfare. Here at the outset will be noticed the more marked distinction between combatants and non-combatants. The former, comprising the armed forces of a state and its officers of government, are alone the objects of attack. The *projet* of the Brussels Conference, § ii., declares that "the operations of war should be aimed exclusively against the forces and military resources of the enemy state, and not against its subjects so long as the latter take no active part in the conflict." The hostile armies fight out the quarrel to a finish, while the persons of women and children, of the workmen in shop and field, of all those connected with religious, charitable, educational, and scientific establishments, are absolutely secure. And, further, the list of non-combatants has been greatly enlarged. For, under the Geneva Convention, all nurses, surgeons, and chaplains in the field, together with their military hospitals and ambulances, are exempt from the operations of war, and neutralized by the use of the recognized sign of a red cross on a white ground. (See Geneva, Convention of.) The labor of an enemy's peasantry is not even to be employed on the military works of the invader. They are absolutely at liberty to engage in their normal occupations. And they are to live and work under their local laws. The status of territory occupied by an invading army is rather anomalous. The sovereignty to which their real allegiance is due has no longer the power to enforce its rights, nor has a new allegiance replaced the old because that is a matter to be adjusted at the close of the war. Meanwhile martial law governs. But it should and will govern largely through the local channels and agents, so that by modern usage an invaded province, after the tide of war has flowed past, resumes its customary life and laws and labor, instead of being harried by its conqueror. All this so long as the province takes no part in the operations of war. For along with these immunities goes a very strict obligation. The conquered people must play no double part. The rustic who sells produce to the invader by day and picks off his stragglers by night is not a warrior, but an assassin, punishable with death. And the provincial government which connives at the attacks upon trains, the breaks in railway communications, the sudden descents upon isolated bodies of soldiers, can and should be brought up sharply through personal or pecuniary penalties. This was repeatedly the case in the Franco-German war.

If, however, the inhabitants of an invaded province band together to resist invasion or rise to drive out the invader, the case is different. It was decided at the Brussels Conference (1874) that the inhabitants of an *unoccupied* territory who took part in such a popular rising or *levée en masse* should be considered as belligerents; and in 1880 this limitation to unoccupied territory was removed by a committee of the Institute of International Law, appointed to draft a code to govern the conduct of war. This probably reflects the present usage. See Brussels Conference and Occupation.

The rules as to lawful weapons adopted by the St. Petersburg Declaration (*q. v.*) have been reaffirmed in all these later attempts at codification. In the Brussels code, after reciting the fact that belligerents have not an unlimited choice of the means of injuring an enemy, the following are forbidden: The use of poison or of poisoned weapons; the treacherous murder of enemy-subjects; the killing of an unarmed enemy; the refusal to give quarter; the employment of arms, projectiles, or substances likely to cause unnecessary suffering, and of small explosives; the abuse of the flag of truce, of the enemy's flag or uniform, or of the red-cross badge of the Geneva Convention. It may be added that the use of half-civilized troops is forbidden unless they are so officered and disciplined as to insure their observance of the rules of civilized warfare.

In the conduct of sieges and bombardments the modern usage displays great consideration not only for persons but property. All pillage is unlawful, however prolonged the resistance; unnecessary destruction of property is forbidden; quarter must be given, and killing cease as soon as resistance stops. Churches, hospitals, establishments devoted to charity, the arts, or to scientific use should be marked by the proper flag and spared as much as practicable. Notice that a bombardment is intended is usually given, that noncombatants may be sheltered from its effects. And, moreover, it is only fortified places that can be shelled. For a hostile fleet to bombard New York, so long as the city is undefended, would be an atrocious violation of the laws of war. When with these rules are contrasted the scenes of the Peninsular war, the burning of Washington, the threat of the French Directory to refuse quarter to a besieged town in case of twenty-four hours' resistance, the change is seen, and these rules are not merely on paper; they have been fairly well observed. Another noteworthy advance is seen in the rules relating to prisoners of war. There must be nothing penal in their treatment. They are in the power of the government of the enemy, not of his troops or of individuals. If not paroled or exchanged, they are confined in the interior of the captor state, and maintained at the cost of their own country, humanely, being allowed to do such work for their support as their rank and bodily condition permit. The prison ships of the Revolution are gone forever; the horrors of Libby and Andersonville can never shock society again. There has also been a decided increase in the efficiency of the care of the wounded, since under the Geneva Convention and the *régime* of Red Cross societies neutral aid has been accepted and permitted to carry out its humane desires on the field of battle. See RED CROSS.

In naval warfare the same tendencies appear, though less marked. On the sea there has not been the same likelihood of atrocities, nor do those who follow the sea call out our sympathies as do the inhabitants of invaded territory. There are no homes to be burned, no fields to be laid waste. There is less to reform. Yet here, as in land warfare, while the destructiveness of war has increased, its barbarity has been lessened. The application of the Geneva Convention to naval war was a step forward. Great Britain no longer impresses seamen out of neutral ships. The crews of blockade runners and ships carrying contraband can not be punished. Quarter is never denied.

Turn now to the other, perhaps the more important, branch of the subject, the laws of war which affect property. Here the tendency toward a humaner, a less destructive system is not only noticeable in the theories of jurists, but has also in many cases been accurately laid down and agreed to by treaty. In Napoleon's time war was made as productive as possible. Indemnities, contributions, exactions of all kinds marked his pathway. Many of the great pictures of Europe were for a time in the possession of France as the spoils of war. Pillage was a means of paying an army. In lieu of pillage towns were heavily fined. Now pillage is forbidden; private property is sacred, unless requisitioned by proper authority, and a receipt given. If a thirsty soldier in a foreign land in time of war wishes a pot of beer he must pay for it; if he takes it by force he may be shot. Contributions may still be levied upon towns or districts, not in lieu of pillage, but as a fine for misbehavior. This is the readiest way of punishing infractions such as broken railways or bridges, attacks upon communications, the killing of stragglers or small parties of soldiers in an occupied territory, where the connivance of the local officials is apparent. Unhappily, indemnities are also still exacted, as the French, Turkish, and Chinese nations know to their cost. In theory an indemnity is a nation's fine for levying unjust war against the victor. But the victor will always hold *his* cause the just one, and indemnities are sure to be abused. They represent a pernicious practice which may well be the next to disappear. The rules which have been indicated forbid waste as a war measure. This, so recently as in the civil war in the U. S., was advocated by the highest military authorities. Through it an enemy was forced to realize the severities of war in order to compel an earlier ending of it. Sheridan in the Shenandoah and Sherman in Georgia ravaged the country far and wide. Sherman estimated that of the $100,000,000 worth of property destroyed by him, only $20,000,000 benefited his own army. The humaner spirit now prevailing is likely to be permanent.

It is curious that while enemy's private property, not contraband, on land is inviolable, at sea the same property in an enemy's ship is still subject to capture. The reason given for this hard discrimination is that capture at sea involves but little suffering while greatly weakening a foe's power of resistance. In theory, property under both conditions is confiscable, but this right is not enforced on land from reasons of humanity. The result of this is to cause the goods of belligerents to seek the protection of a neutral flag temporarily; for by the Declaration of Paris of 1856, the signatories were granted that privilege; the neutral flag covers enemy's goods, except contraband of war.

Although there was much in this declaration to benefit the U. S., the Government of that country has never acceded to it, preferring to cling to the right of privateering and to press the adoption of the Marcy Amendment. (See PRIVATEERING.) Although this temporary gain of an enemy's carrying trade may benefit the neutral, yet it is of far less advantage to him than unrestricted trade and the freedom of the enemy's goods would be. The neutral may not be a carrier or a seafaring state; what trade desires is that its conditions shall be constant, capable of being foreseen, and as unrestricted as possible. This Marcy Amendment, therefore, may very well be the next step in the neutral programme. As it is, the Declaration of Paris was a wonderful stride forward—it is the Bill of Rights of a trading state. See DECLARATION OF PARIS.

In one class of restrictions upon neutral trade there is no softening, and should be none. On the contrary, there seems a tendency to make the rules governing captures for carrying contraband and for breach of blockade more and more stringent. It is but fair when a neutral's innocent trade is enlarged that his guilty trade should be restricted. As yet the burden of prevention in these cases lies on the shoulders of the belligerent. The neutral subject is merely warned that he engages in such trade at his own risk, under penalty of capture. But it has been urged that the neutral government ought to prevent its subjects from engaging in a traffic which directly assists one of its friends in injuring another, and which it may not itself lawfully pursue. Formerly a ship of war, not equipped and manned for service, but simply intended as a commercial venture, was considered contraband merely. Now, as between Great Britain and the U. S. under the three rules of the Treaty of Washington, to permit the sailing of such a ship is a breach of neutrality. The application of the doctrine of continuous voyages by U. S. courts during the civil war tends in the same direction.

For further discussion of the usages of war, as affecting both neutral and belligerent, see the articles INTERNATIONAL LAW, NEUTRALITY, CONTRABAND, BLOCKADE, etc.

THEODORE S. WOOLSEY.

Warasdin', or **Varasdin'**: county in Croatia-Slavonia; separated from Styria in the west by the Matzel Mountains; irrigated by the Drave; is fertile in producing grain, tobacco, wine, and fruits, and rich in cattle, game, and fish. It is the most densely populated county of the Hungarian crown (in 1890, 257,168). The capital, Varasdin, a royal free city, on the right bank of the Drave, 40 miles N. E. of Agram (see map of Austria-Hungary, ref. 7–E), has many Roman Catholic churches and cloisters, a synagogue, and a fortified castle. Its trade in wood and fruits is brisk, and it has factories of tobacco, rosolio, liquor, and vinegar. Pop. 10,370.

H. S.

Warbeck, PERKIN: a pretender to the crown of England who personated Richard, Duke of York, the younger of the two princes supposed to have been murdered in the Tower in 1483. He was said to have been the son of a Jew of Tournay. In 1490 he appeared at the court of Burgundy, where his extraordinary resemblance to Edward IV. was noted, and it is supposed that he was then instructed in the part he was to play on a future occasion. In 1492, in anticipation of the outbreak of hostilities between England and France, he landed at Cork, Ireland, and was joined by numerous partisans, but was soon obliged to fly to France, where he was acknowledged by Charles VIII. as Duke of York, received a pension, and was assigned a body-guard. After the Peace of Étaples he had to leave France; repaired again to Flanders 1493, where he was recognized by Margaret, the duchess-dowager (sister of Edward IV.), as her nephew. After being repulsed from the coast of Kent in July, 1495, and from Ireland in 1496, he proceeded to Scotland; was acknowledged by James IV., and married to Lady Catharine Gordon, daughter of the Earl of Huntley; invaded England with Scottish forces Oct., 1496, and again in the spring of 1497, when he besieged Norham Castle;

landed in Ireland July 30 of that year; proceeded thence to Cornwall, landing at Bodmin Sept. 7: assumed the title of Richard IV., and gathered around him 7,000 men, with whom he besieged Exeter, but was driven back to Taunton. Being hard pressed by the royal forces, he took sanctuary in Beaulieu Abbey, Hampshire; was induced to give himself up by the promise of a pardon; confessed his imposture, and was committed to the Tower in October; escaped to the sanctuary of Sheen June 9, 1498; was retaken in the following year, placed in the stocks at Westminster and at Cheapside, forced to read aloud his confession, and recommitted to the Tower, where, being soon afterward detected in another plan to escape, along with his fellow prisoner, Edward, Earl of Warwick, son of the Duke of Clarence, he was hanged, drawn, and quartered at Tyburn Nov. 23, 1499, Warwick being beheaded five days later. Revised by F. M. Colby.

Warbler [deriv. of *warble* < M. Eng. *werbelen*, from O. Fr. *werbler*, quaver, trill, from O. H. Germ. *wirbilōn* (> Germ. *wirbeln*, warble, trill, liter., whirl]: any small bird of the families *Mniotiltidæ* or *Sylviidæ*. Why the popular name was given it is hard to say, as very few of the warblers sing. The *Mniotiltidæ* have nine primaries, a slender, unnotched bill, and scutellate tarsi. They are a peculiarly American group, comprising over 120 species, all of small size, under 6 inches in length, and many of bright but not gaudy plumage. They are active, largely insectivorous in diet, and vary greatly in their nesting habits, some making simple nests, others structures which rival those of humming-birds in beauty. The *Sylviidæ* have ten primaries, a slender but rather broad, notched bill, and booted or scutellate tarsi. The family contains about 150 species, mostly of Old World birds, and generally of subdued colors. In habits they largely resemble the *Mniotiltidæ*. F. A. Lucas.

War'burton, Eliot Bartholomew George: author; b. at Aughrim, County Galway, Ireland, in 1810; studied at Cambridge; was called to the Irish bar, but soon relinquished that profession to devote himself to the care of his estates. He traveled in the East in 1843; published on his return *The Crescent and the Cross, or Romance and Realities of Eastern Travel* (2 vols., 1844), which obtained immense popularity; settled in London 1844; published *Memoirs of Prince Rupert and the Cavaliers* (3 vols., 1849); *Reginald Hastings* (3 vols., 1850), a novel of the great rebellion; *Memoirs of Horace Walpole and his Contemporaries* (2 vols., 1851); *Darien, or the Merchant Prince, an Historical Romance* (3 vols., 1851); and *A Memoir of Charles Mordaunt, Earl of Peterborough* (3 vols., 1853). He perished in the burning of the steamer Amazon off Land's End Jan. 4, 1852. Revised by H. A. Beers.

Warburton, William, D. D.: Bishop of Gloucester; b. at Newark-upon-Trent, Dec. 24, 1698, where his father was an attorney and town-clerk; attended school at Newark and Oakham; in 1719 began the practice of law at Newark, but in 1723 abandoned the law and took deacon's orders; in 1727 was ordained priest, and made vicar of Gryesly, Nottinghamshire; became rector of Brant Broughton, Lincolnshire, 1728; preacher to the society of Lincoln's Inn, London, 1746; prebendary of Gloucester 1753; king's chaplain in ordinary 1754; prebendary of Durham 1755; dean of Bristol 1757, and in 1760 Bishop of Gloucester, where he died June 7, 1779. His spirited defense, in 1739–40, of Pope's *Essay on Man* against the charge of atheism made the poet his ardent and lifelong friend. He published *Miscellaneous Translations in Prose and Verse* (1723); *An Inquiry into the Causes of Prodigies and Miracles* (1727); *Alliance between Church and State* (1736); *Divine Legation of Moses demonstrated, on the principles of a religious Deist, from the omission of the doctrine of a future state of reward and punishment in the Jewish Dispensation* (his greatest work, 1738–41; 10th ed. 3 vols., 1846); a very poor edition of *Shakspeare* (1747); *Julian, or a Discourse concerning the Earthquake and Fiery Eruption which defeated the Emperor's Attempt to rebuild the Temple at Jerusalem* (1750): an edition of *Pope's Works* (1751; Pope, in his will, left him the copyright of his MSS., and appointed him their editor); *View of Bolingbroke's Posthumous Writings* (1754; contains a defense of revelation, which is "universally allowed to be a most masterly performance"); *The Doctrine of Grace* (1762). His own works were published by his friend Bishop Hurd, with a *Memoir* prefixed (7 vols., 1788–94). His *Letters* to Hurd appeared in 1808, and *Literary Remains* in 1841. See the *Life* by Rev. John Selby Watson (1863). Revised by S. M. Jackson.

Ward [O. Eng. *weard*, keeping watch, guard (: O. H. Germ. *warta*), deriv. of *weardian*, to guard, watch: O. H. Germ. *wartēn* < Teuton. **ward-*, deriv. of *war-* > Germ. *wahren, bewahren*, heed: Eng. *wary*; cf. Gr. ὁρᾶν, *Ϝορᾶν < Indo-Eur. *u̯or-*]: in feudal law, the heir of the king's tenant in capite during his non-age, but in general language the term is applied to all infants under the power of guardians. See Guardian.

Ward, Adolphus William: literary historian and biographer; b. at Hampstead, London, England, Dec. 2, 1837; educated in Germany and at Peterhouse College, Cambridge, and became Professor of History at Owen's College, Manchester, in 1866; afterward was principal of the college. Besides contributions to the *Encyclopædia Britannica* and leading English reviews, he is author of *The House of Austria in the Thirty Years' War* (1869); *Dramatic Literature of the Age of Elizabeth* (2 vols., 1875); and *Lives* of Chaucer (1879) and Dickens (1882), in the English Men of Letters series; translator of Curtius's *History of Greece* (5 vols., 1868–74); and editor of *Pope's Poems* (Globe ed. 1869) and of the Chetham Society's edition of *Byron's Poems* (1894). Revised by H. A. Beers.

Ward, Ann: See Radcliffe, Ann.

Ward, Artemas: soldier and jurist; b. at Shrewsbury, Mass., Nov. 27, 1727; graduated at Harvard 1748; served in the French and Indian war, becoming lieutenant-colonel; was appointed a general officer by the Massachusetts provincial congress Oct. 27, 1774, and commander-in-chief of Massachusetts forces May 19, 1775; was in nominal command at the battle of Bunker Hill, though he remained at headquarters at Cambridge, and had no actual share in determining the events of that day; was appointed by the Continental Congress first on the list of major-generals June 17, 1775; was in command of the forces besieging Boston until the arrival of Gen. Washington, after which he was second in command; resigned Apr., 1776, in consequence of ill health; was chief justice of common pleas for Worcester County, 1776; president of the Massachusetts executive council 1777; sat in the Legislature sixteen years; was Speaker of that body 1785, and member of Congress 1791–95. D. at Shrewsbury, Oct. 28, 1800.

Ward, Artemus: See Browne, Charles Farrar.

Ward, Edgar Melville: genre-painter; b. in Urbana, O., Feb. 24, 1839; studied at the National Academy of Design, New York, and under Cabanel, in Paris; National Academician 1883. His pictures of scenes of country-life in the U. S. are good in the rendition of character. *Brittany Washerwomen* (1876), *The Sabot Maker* (1878), *The Collar Shop* (collection of T. B. Clarke, New York), and *The Quilting Party* (1892) are some of his principal works. His studio is in New York. William A. Coffin.

Ward, Edward Matthew, R. A.: painter; b. at Pimlico, London, England, in 1816; was a nephew of Horace and James Smith, authors of the *Rejected Addresses*; became in 1834 an art student at the Royal Academy, where he enjoyed special instruction from Wilkie, and exhibited a decided talent for original composition and color; studied at Rome 1836–39, gaining the silver medal of the Academy of St. Luke 1838; pursued a course of fresco-painting under Cornelius at Munich; exhibited his first picture at the Royal Academy 1839; presented unsuccessfully his *Boadicea* in the cartoon competition at Westminster Hall 1843; was brought into favorable notice by his *Dr. Johnson reading the MS. of the Vicar of Wakefield* (1843), *Goldsmith as a Wandering Musician* (1844), and *Dr. Johnson in the Anteroom of Lord Chesterfield* (1845); devoted himself successfully to the illustration of English and French history by a series of large pictures; was commissioned to paint eight pictures in oil for the corridor of the House of Commons 1852, three of which have since been reproduced in fresco and two in water-glass. He exhibited frequently in the Royal Academy, was made an associate in 1847, and became an Academician 1856. D. at Windsor, Jan. 15, 1879.

Ward, Elizabeth Stuart (*Phelps*): novelist and poet; b. at Andover, Mass., Aug. 13, 1844; daughter of Prof. Austin Phelps of the Andover Theological Seminary. She has resided mostly at her native place, devoting herself to the pursuit of letters and to various philanthropic and reform movements. In 1888 she was married to Rev. Herbert D. Ward, of New York. Her story *The Gates Ajar* (1868) made a strong impression, and has been followed by *Men, Women, and Ghosts* (1869); *The Silent Partner* (1870); *The*

Trolly Book (1870); *The Story of Avis* (1877); *Old Maids' Paradise* (1879); *Beyond the Gates* (1883); *Dr. Zay* (1884); *The Gates Between* (1887); and, in collaboration with her husband, *The Master of the Magicians* (1890), and *Come Forth* (1890). She has contributed many short stories to the magazines, and published a volume of essays, *The Struggle for Immortality* (1889); *Poetic Studies*, verse (1875); *Songs of the Silent World* (1885), etc. Religious earnestness and a certain tenseness of the conscience and the emotions, characteristic of New England and of Puritan inheritance, distinguish the work of this very popular writer. H. A. B.

Ward, Frederick Townsend: b. at Salem, Mass., Nov. 29, 1831; educated at the Salem High School; was a lieutenant in the French service during the Crimean war; was with Walker in Nicaragua; became admiral-general in the service of the Emperor of China; organized the Chinese soldiers by modern methods, and won many victories over the rebel Taipings, but was killed in an engagement with them near Ningpo, Sept. 21, 1862.

Ward, Henry Augustus: naturalist; b. at Rochester, N. Y., Mar. 9, 1834; educated at Williams College and at the Lawrence Scientific School of Harvard University, where he became assistant to Prof. Agassiz in the museum of comparative zoölogy; went to Europe in 1854; studied zoölogy at Paris and mineralogy at Freiberg; traveled in Palestine, Arabia, Egypt, Nubia, and the west coast of Africa, ascending the Niger; subsequently visited the West Indies, Central America, and the Western Territories of the U. S. as a mining engineer; was Professor of Natural Sciences at Rochester University 1860–75; established there a laboratory for the production of facsimiles of rare fossils, since extended to include various branches of natural history; made an extensive collection of modern zoölogy; was naturalist to the U. S. expedition to Santo Domingo 1871; and has since traveled extensively in various parts of the world. The Ward cabinets of mineralogy and geology at the University of Rochester occupy a large portion of Sibley Hall. Revised by F. A. Lucas.

Ward, Mrs. Humphry: See Ward, Mary Augusta.

Ward, John Quincy Adams: sculptor; b. at Urbana, O., June 29, 1830. About 1849 he went into the studio of Henry Kirke Brown (*q. v.*) and assisted him in some of his works, especially the equestrian statue of Washington in Union Square, New York. Between 1857 and 1861 he resided chiefly in Washington, D. C., where he made portrait-busts of some of the leading public men. During the excitement of the breaking out of the civil war he modeled his celebrated statuette of *The Freedman*, which represents a Negro breaking his manacles. This work became very popular because of its subject, and was of real excellence; many copies were sold in bronze, as well as in other material. In 1863 he modeled the *Indian Hunter*; he visited the western frontier that he might see the American Indians at home and found great instruction and inspiration in the opportunities there afforded him of studying the nude form of man in vigorous action. In 1864 the *Indian Hunter* was cast in bronze and put up in Central Park, New York city. Before this time Ward had opened a studio in New York, where he has since resided. Of figures of life size and larger he has completed for New York city the *Seventh Regiment Monument*, consisting chiefly of a colossal figure of a uniformed soldier of the regiment; a bronze statue of Shakspeare, in Central Park; a seated figure of Horace Greeley, in front of the office of *The New York Tribune*; a statue of Senator Conkling, in Madison Square; a statue of William E. Dodge, at Broadway and West Thirty-fourth Street; a statue of Washington, in front of the Sub-Treasury in Wall Street, on the spot where Washington took the oath of office as the first President of the U. S. in 1789; *The Pilgrim*, a bronze statue larger than life, erected in 1885 to commemorate the landing of the Pilgrims on Plymouth Rock. There is also a bust of Alexander L. Holley in Washington Square. His colossal statue of Henry Ward Beecher stands in front of city-hall in Brooklyn. One of his most important works is the equestrian statue of Gen. George H. Thomas, in Thomas Circle, Washington. In the same city is the statue of President Garfield, with three colossal emblematic figures at the base of the pedestal. In Boston is a large group commemorative of the discovery of the anæsthetic properties of ether; it represents *The Good Samaritan*, and was erected about 1865. The statue of Gen. John F. Reynolds, at Gettysburg, the statue of Israel Putnam, at Hartford, Conn., those of Gen. Lafayette, at Burlington, Vt., and of Gen. Daniel Morgan, at Spartansburg, S. C., and very many portrait-busts are included in his works. He was president of the National Academy of Design 1872–73, and has always been active in the management of that institution. He was one of the founders of the National Sculpture Society in 1893; was its first president, and was re-elected to that office in Jan., 1895. Russell Sturgis.

Ward, Lester Frank: geologist and botanist; b. at Joliet, Ill., June 18, 1841; attended various schools in the early part of his life; served in the Union army during the civil war; graduated at Columbian University, Washington, in 1869, and later received LL. B. and A. M. from that institution. Since 1865 he has lived in Washington, D. C., holding various civil positions—chief of the navigation division and librarian of the U. S. bureau of statistics—and in 1881 he entered the U. S. Geological Survey, where he has had charge of the paleobotany. He is also honorary curator of fossil plants in the U. S. National Museum. His scientific papers, etc., number about 400. In 1869 he conceived, and in the following years outlined, an extensive work on social science, which culminated in the publication of his *Dynamic Sociology* (2 vols., New York, 1883), and in 1893 he published *The Psychic Factors of Civilization* (Boston). Aside from these, his more important papers are a pamphlet entitled *Haeckel's Genesis of Man* (1879); *Guide to the Flora of Washington and Vicinity* (1881); *Sketch of Paleobotany* (Fifth Annual Report U. S. Geol. Survey, 1885); *The Geological Distribution of Fossil Plants* (Eighth Annual Report U. S. Geol. Survey, 1889); *The Course of Biologic Evolution* (1890); and *Neo-Darwinism and Neo-Lamarckism* (1891). He also contributed the botanical matter to *The Century Dictionary* from H to Z, and the article on *Plants, Fossil*, to *Johnson's Universal Cyclopædia* (1895).

Ward, Mary Augusta (*Arnold*): novelist; b. at Hobart, Tasmania, in 1851; eldest daughter of Thomas Arnold and niece of Matthew Arnold. Her father returned to England in 1856, and in 1872 she was married to Thomas Humphry Ward. She published *Milly and Olly* (1881); *Miss Bretherton* (1884), the heroine of which was popularly identified with Mary Anderson, the actress; a translation of *Amiel's Journal* (1885); *Robert Elsmere* (1888), a story dealing with religious doubt, which made a powerful impression and had an enormous circulation in England and the U. S.; *The History of David Grieve* (1892); *Marcella* (1894); and *The Story of Bessie Costrell* (1895). In 1890 she aided in establishing University Hall, in London, a settlement among the poor, and remains its honorary secretary. Henry A. Beers.

Ward, Nathaniel: author; b. at Haverhill, Suffolk, England, about 1578; studied at Emmanuel College, Cambridge; graduated 1603; was for some years a lawyer, but later became preacher at St. James's, Duke's Place, London, and afterward rector of Standon Massaye, Essex. He became connected with the Massachusetts Company in 1630, emigrated to Massachusetts in 1634, and immediately became pastor at Agawam or Ipswich; resigned his charge on account of ill health Feb., 1637; took part in the settlement of Haverhill (named from his native place) May, 1640; was the author of the *Body of Liberties* adopted Dec., 1641, being the first code of laws established in New England; returned to England 1646; took part as a pamphleteer in the great political struggle then going on; became pastor of Shenfield, Essex, 1648, and died there in Oct., 1652. He was the author of *The Simple Cobbler of Agawam* (1647), a quaint political satire; *Mercurius Anti-Mechanicus, or the Simple Cobbler's Boy, with his Lap full of Caveats* (1648); *A Religious Retreat Sounded to a Religious Army* (1647); and a *Sermon before Parliament* (1647). A *Memoir* by John Ward Dean was published at Albany in 1848.
Revised by H. A. Beers.

Ward, Robert Plumer: author; b. in London, England, Mar. 19, 1765; educated at Oxford; was admitted to the bar in 1790, and wrote a number of juristic works which brought him into favorable notice. He sat in Parliament for Cockermouth 1802–05, and was afterward Under Secretary of Foreign Affairs; was member of Parliament for Haslemere 1807–20; became Lord of the Admiralty in the Portland administration 1807; was clerk of the ordinance 1811–23, and auditor of the civil list from 1823 to 1831, when he retired from political life on a pension of £1,000, and spent his remaining years in literary work. D. at Okeover Hall, Staffordshire, Aug. 13, 1846. Among his juristic writings were *An Inquiry into the Foundation and History of the Law of Nations, etc.* (1795) and *A Treatise of the*

Relative Rights and Duties of Belligerents and Neutral Powers in Maritime Affairs, etc. (1801). He published anonymously *Tremaine, or the Man of Refinement* (1825), and *De Vere, or the Man of Independence* (1827), novels which had extraordinary popularity as delineations of English society, and subsequently issued *De Clifford* (1841) and other novels, and *An Historical Essay on the Real Character and Amount of the Precedent of Revolution of 1688* (2 vols., 1838). See E. Phipps, *Memoirs of the Political and Literary Life of Robert Plumer Ward, Esq.* (1850).
Revised by F. M. Colby.

Ward, William: missionary; b. at Derby, England, Oct. 20, 1769; learned the printer's trade; was licensed as a Baptist preacher; was sent in both capacities as a missionary to India 1799; settled at Serampore; printed numerous religious works in the Bengali language; wrote *An Account of the Writings, Religion, and Manners of the Hindoos, including Translations from their Principal Works* (Serampore, 4 vols. 4to, 1811; 5th ed. Madras, 1863); visited England, Holland, and the U. S. 1819–21, delivering addresses upon the cause of missions, and printed *Farewell Letters to a Few Friends in Britain and America, on Returning to Bengal in 1821* (London, 1821). D. of cholera at Serampore, Mar. 7, 1823. His *Account* was long a leading authority upon Indian matters, and may still be profitably consulted upon some points, although later works have revealed many inaccuracies in the description of native religions, and still more in the translations. A volume of *Memoirs* (1825) was prepared by Samuel Stennett, and a more adequate biography is in the *Life and Times of Carey, Marshman, and Ward, embracing the History of Serampore Mission* (2 vols., 1859; abridged ed., New York, 1867), by John Clark Marshman. Revised by S. M. Jackson.

Ward, William Hayes, D. D., LL. D.: Orientalist and editor; b. at Abington, Mass., June 25, 1835; graduated at Amherst College 1856, at Andover Theological Seminary 1859, ordained in 1859, and became acting pastor of the Congregational churches of Oskaloosa and Grasshopper Falls, Kan.; in 1857–58 taught the natural sciences in Beloit College; in 1862 became teacher of sciences in the Utica Free Academy; in 1865–68 was Professor of Latin in Ripon College, Wisconsin; in 1868 joined the editorial staff of the New York *Independent*, of which he became superintending editor in 1870. He is a member of the American Oriental Society, and in 1889 was elected its president. He has published various articles in the *Bibliotheca Sacra* and in other journals on biblical criticism and Assyriology. The second statement of the American Palestine Exploration Society contains a paper of his on the Hamath inscriptions. In 1884 he led an exploring party to ancient Babylonia, of which he published a report in pamphlet form.
Revised by George P. Fisher.

Warden, David Baillie, M. D.: author; b. in Ireland in 1778; emigrated to the U. S. in youth; received a classical education; graduated at the New York Medical College; was appointed secretary of legation to France 1804, and resided at Paris forty years, filling most of the time the office of U. S. consul; was well known in literary circles, and formed two libraries of American books which were acquired respectively by Harvard College (1823) and by the New York State Library (about 1840). He was the author of *A Statistical, Political, and Historical Account of the United States of North America* (Edinburgh, 3 vols., 1819), also published in French (Paris, 5 vols., 1820) and in German (Ilmenau, 1824); *L'Art de vérifier les Dates, Chronologie historique de l'Amérique* (Paris, 10 vols., 1826–44); *Bibliotheca Americana septentrionalis, etc.* (1820); and *Bibliotheca Americana* (1831); *Recherches sur les Antiquités de l'Amérique septentrionale* (Paris, 1827), which originally appeared in *Antiquitates Mexicanæ* (Paris, 2 vols. folio, 1834–36); and several other minor publications. D. in Paris, Oct. 8, 1845.

War Department: in the U. S., an executive department of the Government, having control of military affairs; under the supervision of the President, as commander-in-chief of the army, and under the immediate direction of the Secretary of War, an officer of the cabinet appointed by the President by and with the advice and consent of the Senate. The chief functions of the secretary are the supervision of all estimates of appropriations for the expenses of the department and of the administration of the military service, the control of the board of ordnance and fortification, the supervision of the U. S. Military Academy at West Point, and the general direction of all matters relating to river and harbor improvements. In the performance of his duties he is aided by an assistant secretary and a chief clerk. The department is subdivided into military bureaus, each under the direction of an officer of the regular army. These officers are the adjutant, inspector, quartermaster, commissary, surgeon, and paymaster generals, the chief of engineers, the chief of ordnance, the judge-advocate-general, and the chief signal officer. F. M. C.

Wardian Case [named from Nathaniel Bagshaw Ward, its inventor, an Englishman]: a box whose sides and top are of glass, containing at the bottom a layer of earth, and used for growing ferns and other plants in parlor-culture. Probably from the fact that the air within is highly charged with moisture, many beautiful plants thrive well in Wardian cases which can not be grown in the open air.

Wardlaw, Ralph, D. D.: preacher and professor of theology; b. at Dalkeith, Midlothian, Scotland, Dec. 22, 1779; educated at the University of Glasgow and at the divinity school of the United Secession Church, for the ministry of which he was intended, but joined the Independent or Congregational denomination; in 1803 was ordained pastor of the North Albion Street chapel, Glasgow, Scotland, where, and at the chapel of the same congregation in West George Street, he labored through life, filling also gratuitously from 1811 the professorship of Systematic Theology in the Independent Theological Academy of that city. In 1853 the fiftieth anniversary of his ministry was celebrated by a public meeting and the formation of a fund for the establishment of the "Wardlaw Jubilee School and Mission-house" at Dove Hill, Glasgow. He was for many years the recognized head of the Independent body, which through his influence was widely extended through Scotland. He was the author of several treatises on the Socinian controversy, infant baptism, and Christian ethics, of *Expository Lectures on the Book of Ecclesiastes* (2 vols., 1821); *Lectures on Systematic Theology* (3 vols., 1856–57); and other works. D. at Glasgow, Dec. 17, 1853. His *Life* was written by Rev. Dr. W. L. Alexander (1856). Revised by S. M. Jackson.

Ware: town of England; county of Herts; on the Lea; 2½ miles E. N. E. of Hertford (see map of England, ref. 11–K). St. Mary's church, portions of which date from 1380, was restored in 1885–86. The great bed of Ware referred to in *Twelfth Night* has been taken to Rye House, 2 miles distant. Ware has breweries and malting establishments, and is celebrated in Cowper's poem, *John Gilpin*. Pop. (1891) 5,121.

Ware: town (made a precinct in 1742, a district in 1761, and a town in 1775); Hampshire co., Mass.; on the Ware river, and the Boston and Albany and the Boston and Maine railways; 12 miles N. of Palmer, 25 miles N. E. of Springfield (for location, see map of Massachusetts, ref. 3–E). It has an elevation of 550 feet above sea-level, is compactly built, and has narrow but well-graded streets and sidewalks, an excellent water-supply, and gas and electric-light plants. There are 8 churches, high school, 28 district schools, public library of 12,000 volumes, Roman Catholic parochial school, and a weekly newspaper. The town has annual receipts and expenditures balancing at about $86,000; net debt, $145,900; assessed valuation, over $4,000,000. There are a national bank with capital of $300,000, and a savings-bank with deposits of nearly $3,500,000. The principal industry is the manufacture of cotton and woolen goods. Pop. (1880) 4,817; (1890) 7,329; (1900) 8,263.
Edward H. Gilbert.

Ware, Henry, D. D.: theologian; b. at Sherburne, Mass., Apr. 1, 1764; graduated at Harvard 1785; pursued the study of theology 1785–87; was ordained pastor of the first church at Hingham, Mass., Oct. 24, 1787; was a leader in the direction of the Unitarian opinions then becoming prevalent among the Congregationalists of New England; precipitated the theological crisis by his acceptance of the Hollis professorship of Divinity in Harvard University 1805, but took no part in the controversy thereby excited until some years later, when he published *Letters to Trinitarians and Calvinists, occasioned by Dr. Woods's Letters to Unitarians* (Cambridge, 1820), followed by *An Answer to Dr. Woods's Reply* (1822) and *A Postscript to an Answer, etc.* (1823). He printed a number of single sermons, and issued in 1842 one of his courses of theological lectures with the title *An Inquiry into the Foundation, Evidences, and Truth of Religion* (Cambridge and London, 2 vols., 1842).

In addition to his professorship, which he resigned in 1840 in consequence of the loss of his sight, he had charge of the Harvard Divinity School from its foundation in 1826 to his death at Cambridge, July 12, 1845. His opinions were conservative among Unitarians, and he became a founder of that "Unitarian orthodoxy" which Channing heartily condemned and which Andrews Norton defended against Emerson and Ripley in 1839—men whose intellectual freedom he had inspired by his critical studies.

Revised by J. W. CHADWICK.

Ware, HENRY, Jr., D. D.: preacher and author; son of Henry Ware, theologian; b. at Hingham, Mass., Apr. 21, 1794; graduated at Harvard 1812; taught at Phillips (Exeter) Academy 1812–14; studied theology under his father's direction; was ordained pastor of the Second church (Unitarian) at Boston, Jan. 1, 1817; took an active part in the formal organization of the Unitarian body, editing its organ, the *Christian Disciple*, which afterward became the *Christian Examiner*; visited Europe 1829–30; resigned his pastorate on account of ill health 1830, and filled the Parkman professorship of Pulpit Eloquence in the Divinity School of Harvard University 1830–42. He was the author of *Hints on Extemporaneous Preaching* (1824); *Recollections of Jotham Anderson, Minister of the Gospel* (about 1824); *On the Formation of the Christian Character* (1831); *Life of the Saviour* (1832; new ed. New York, 1868); *The Feast of the Tabernacles* (1837), a poem prepared for an oratorio; *Memoirs* of Rev. Dr. Parker (1834), Dr. Noah Worcester, Dr. Joseph Priestley, and Oberlin; and *Scenes and Characters illustrating Christian Truth* (2 vols., 1837), besides miscellaneous poems and single sermons. D. at Framingham, Mass., Sept. 22, 1843. A *Memoir* was published by his brother, John Ware, M. D. (Boston, 1846). Four volumes of selections from his writings were edited by Rev. Chandler Robbins (1846–47). Revised by J. W. CHADWICK.

Ware, WILLIAM: author; son of Henry Ware, theologian; b. at Hingham, Mass., Aug. 3, 1797; graduated at Harvard 1816; taught school at Hingham 1816–17; studied theology under his father's direction, graduating at Cambridge 1819; preached successively at Northboro, Mass., Brooklyn, Conn., and Burlington, Vt.; was pastor of the First Unitarian church in New York city from Dec. 18, 1821, to Oct. 19, 1836; preached at Brookline, Mass., 1836–37, at Waltham 1837–38; settled without pastoral charge at Jamaica Plains 1838, and at Cambridge 1839; was editor and proprietor of the *Christian Examiner* 1839–44; was pastor of a church at West Cambridge 1844–45; resigned on account of failing health; settled again at Cambridge, where he occasionally preached; spent a year in Europe, chiefly in Italy, 1848–49. He was the author of *Letters from Palmyra* (New York, 2 vols., 1837), which appeared in the *Knickerbocker Magazine* the previous year, and were subsequently republished in London and New York with the title *Zenobia, or the Fall of Palmyra* (new ed. 1868); *Probus, or Rome in the Third Century* (2 vols., 1838), subsequently republished as *Aurelian* (new ed. 1868); *Julian, or Scenes in Judea* (New York, 2 vols., 1841); *Sketches of European Capitals* (1851); *Lectures on the Works and Genius of Washington Allston* (1852); and a *Life of Nathaniel Bacon*, in Sparks's series; editor of *American Unitarian Biography* (2 vols., 1850). D. at Cambridge, Mass., Feb. 19, 1852. Revised by J. W. CHADWICK.

Wareham: town (incorporated in 1739); Plymouth co., Mass.; on Buzzard's Bay, and the N. Y., N. H. and Hart. Railroad; 16 miles N. E. of New Bedford, 49 miles S. E. of Boston (for location, see map of Massachusetts, ref. 5–J). It contains the villages of Wareham, West Wareham, South Wareham, East Wareham, and Onset; has 4 churches, high school, 18 district schools, public library, national bank with capital of $100,000, and a savings-bank; and is principally engaged in cranberry-growing and iron-manufacturing. In 1894 it had an assessed valuation of nearly $2,000,000. Pop. (1880) 2,896; (1890) 3,451; (1900) 3,432.

Warehouseman: one who receives and stores goods as a business for compensation. He is a bailee for hire, and is bound to take ordinary care of the property intrusted to him. (See BAILMENT and NEGLIGENCE.) According to the prevailing view in the U. S., the business of a warehouseman may be so affected with a public interest as to justify the Legislature in fixing his charges. Hence statutes declaring grain elevators public warehouses, regulating their use, and prescribing schedules of charges have been held constitutional, even though the elevators in question were not practical monopolies to which the citizens were compelled to resort, and by which a tribute could be exacted from the community. (*Brass* vs. *Stoeser*, 153 U. S. 391, A. D. 1894, four judges dissenting.) The correctness of this view has been strenuously denied. "The vice of the doctrine is," said Justice Brewer, dissenting in *Budd* vs. *New York*, 143 U. S. at p. 548, "that it places a public interest in the use of property upon the same basis as a public use of property. . . . I believe the time is not distant when the evils resulting from this assumption of a power on the part of government to determine the compensation a man may receive for the use of his property or the performance of his personal services will become so apparent that the courts will hasten to declare that government can prescribe compensation only when it grants a special privilege, as in the creation of a corporation, or when the service which is rendered is a public service, or property is in fact devoted to a public use." This opinion, as well as the dissenting opinion of Judge Peckham in the same case, in 117 N. Y. 34–71, will repay the most careful perusal. FRANCIS M. BURDICK.

Warehouse Receipts: documents issued by warehousemen, reciting that certain goods have been received by them and are deliverable upon the indorsement and return of the receipts and the payment of charges. Such instruments are frequently declared negotiable by statute or by the agreement of the parties. Their indorsement and delivery operate as a symbolical delivery of the goods to which they refer. Hence the owner of goods who sells and gives a warehouse receipt for them loses his vendor's lien, although they remain in his warehouse, if the receipt is transferred by the purchaser to a *bona-fide* holder. (*Greenbaum* vs. *A. Furst Distillery Co.* (Ky.), 25 S. W. R. 498.) When they are negotiable, their transferee may acquire rights which the transferrer did not have. For example, if they describe the goods as deposited in a free warehouse—that is, one where they are free from taxes or duties—their *bona-fide* purchaser will be entitled to recover the goods from the warehouseman without paying such taxes or duties, although his vendor knew the taxes or duties had not been paid, and was under an obligation to pay them.

These receipts, however, are not treated as negotiable paper in the full sense of that term. They are not representatives of money, nor securities for the payment of money. Those who issue them are not guarantors that the persons to whose order the goods to which they refer are deliverable are the owners of such goods. *Insurance Co.* vs. *Kiger*, 103 U. S. 352. FRANCIS M. BURDICK.

Warehousing System: a credit system, whereby the Government extends the time for the payment of duties and revenue upon goods, retaining them in its possession meanwhile, to secure such payment. Duties on imports or on manufactures naturally fall due as soon as the goods arrive in the port or are produced on the soil of the government imposing them. But the economy and convenience of importing and manufacturing articles in great quantities and in advance of their actual requirement for consumption is so great, and the immediate payment of duties upon them would often involve such a large and unremunerative investment of the capital of importers and manufacturers, that the principle of warehousing goods in Government custody, with a reasonable extension of time for the payment of the duties and other Government charges, has been adopted by all the leading commercial nations. The payment of the duties is secured by a bond given by the importer or owner of the goods to the Government, with sufficient sureties, stipulating for the payment of the duties within the credit period provided by law. The goods are then said to be "in bond," the period allowed for the payment of the duties, etc., is the "bonded period," and the places of deposit are known as "bonded warehouses," or, less frequently, as "bonded stores." The importer or owner has access to the goods for the purpose of disposing of them at any time during the bonded period, and he thus practically pays the duties when he sells the goods. Under the statutes providing for such a system the duties, although levied at the time when the goods are received at the port of entry or when the manufacture of them is completed, do not become payable until the withdrawal of the goods or the expiration of the whole term of credit, and consequently the consignee or owner is free from any interest charges upon the duties payable by him.

The system is of comparatively recent origin, having been first adopted in Great Britain in 1802. It is now governed in that country by the Customs Consolidation Act of 1853.

and its amendments. In the U. S. the system, notwithstanding its manifest conveniences, was not established till 1846, though it had for more than a score of years been persistently urged upon the attention of Congress by the leading commercial bodies of the country. Confined at first to the warehousing of imported merchandise, it has been developed by subsequent legislation into a very elaborate and somewhat complicated system for the Government control, in its own or in private warehouses, of nearly all classes of dutiable and taxable goods, whether imported or of domestic production. This system will be better understood if the two classes are considered separately.

I. Bonded Warehouses for Imported Goods.

The warehousing system, when finally established, did away entirely with the old system of credits on imports, the immediate payment of duties being postponed only on those goods that were stored in the Government warehouses. The original act, passed Aug. 6, 1846, has been extensively modified by subsequent legislation, especially by an act passed Mar. 28, 1854, and the tariff law of 1890 (the McKinley Act). Under these statutes an elaborate official classification of bonded warehouses has been adopted. As the several classes are usually designated by the numbers assigned to them, it is necessary to enumerate them here, notwithstanding the fact that the original classification has become defective, and does not include several classes which have been created by recent acts of Congress. This classification is as follows:

Class I. Government Bonded Warehouses.—These are maintained by the Government in buildings owned or leased by it, and exist only in those ports in which there are no private bonded warehouses, or where the latter are not adequate to transact the business of the port. They are in the immediate and exclusive custody of the collector, who conducts a general storage business for dutiable goods in behalf of the Government.

Class II. Importers' Bonded Warehouses.—These belong to the class of private warehouses, and may be established by the Secretary of the Treasury in certain cases where it seems desirable to make special provision for the warehousing of the goods of a large importer or purchaser of imported goods. The building employed as a warehouse must be exclusively devoted to that purpose, and the owner or importer pays for the services of the customs' officer in charge of the same.

Class III. Private Bonded Warehouses.—These were authorized by the act of 1854, above referred to, and, under Government supervision, do the bulk of the warehousing business in the ports of entry of the U. S. They are owned and conducted by private parties, who carry on an ordinary storage business for their own profit, the Government extending its authority over them and retaining a virtual possession of and control over the goods stored therein. No person has a right to keep a warehouse for the storage of dutiable goods unless appointed by the Secretary of the Treasury, who may revoke such appointment at his pleasure.

Class IV. Private bonded warehouses, consisting of yards or sheds of suitable construction for the storage of wood, coal, mahogany, dyewoods, lumber, molasses, sugar in hogsheads and tierces, railroad, pig, and bar iron, anchors, chain cables, and other articles specially authorized. These yards or sheds must be built and inclosed in a prescribed way.

Class V. Private bonded warehouses, consisting of bins or parts of warehouses or elevators separated from the rest of the building, and used exclusively for the storage of grain.

Class VI. Private bonded warehouses, consisting of cellars or vaults, used exclusively for the storage of imported wines and distilled liquors.

To the foregoing enumerated classes of bonded warehouses should now be added two non-enumerated classes of more recent origin, viz.:

(*a*) *Importers' bonded warehouses*, created by act of Mar. 24, 1874, for the storing and cleaning of rice, which has been imported for the purpose of cleaning and re-exporting the same; and

(*b*) *Bonded manufacturing warehouses*, created by the Tariff Act of 1894 (Sec. 9), for the manufacture of articles in whole or in part of imported materials, or of materials subject to internal-revenue tax, and intended for exportation.

II. Bonded Warehouses for Domestic Products.

In addition to the foregoing classes of bonded warehouses provided for the storage and custody of dutiable imports, the Treasury Department has, under the authority of successive acts of Congress, established the following classes of warehouses for the storage of domestic products which are subject to internal-revenue taxes.

A. *Distillery Warehouses.*—The creation of bonded warehouses for the storage of distilled spirits formed an important part of the internal-revenue system, established by the so-called Internal Revenue Act of July 20, 1868. The warehouses provided for by this act were, in respect of their ownership, custody, and regulation, similar to those of the second and sixth classes above described. They consisted of buildings or parts of buildings, belonging to the distiller, exclusively devoted to the storage of the product of the distillery to which they belonged, but under the immediate and constant supervision of the internal-revenue collector of the district. The spirits, as soon as stored, passed into the legal possession and control of the Government.

B. *Special Bonded Warehouses.*—The development of the industry of manufacturing spirits from grapes and other fruits led to the enactment, Mar. 3, 1877, and Oct. 18, 1888, of laws authorizing the establishment by collectors of internal revenue of warehouses for the storage of brandy made from such fruits.

C. *General Bonded Warehouses.*—These are intended to supplement and perhaps, in most cases, to supersede the distillery warehouses above described. The authority for their establishment is contained in the Tariff Act of Aug. 27, 1894, known as the Wilson Act. They are to be used exclusively for the storage of spirits distilled from materials other than fruit, and it is provided that such spirits may be transferred by the collector from the distillery warehouses to the warehouses established under the act.

D. *Bonded Manufacturing Warehouses.*—These have already been briefly referred to above, in connection with the system established by Congress for the warehousing of imported goods. The act creating or authorizing them (Tariff Act of 1894) exempts from internal-revenue taxation articles otherwise subject thereto, which are employed in the manufacture of goods intended for exportation. Warehouses of this class are established to provide for Government supervision of such articles until thus manufactured and exported.

The rules governing the reception and custody of goods and the rights of the Government in the same, in these several classes of warehouses, are substantially identical. Merchandise of a perishable nature and gunpowder and other explosive substances, except firecrackers, are not entitled to storage. If any such articles are deposited, either in public or private stores, the collector is required to sell them forthwith. The right of the importer or owner to withdraw goods upon payment of the duties and charges is limited to the credit period provided by the statute. At the end of that period—which is now (with an exception to be noted hereafter) uniformly fixed at three years—the goods are forfeited to the Government, and must then be sold and the proceeds paid into the Treasury. There is no right of redemption, and the owner can not prevent such sale by tendering the amount due after the bonded period has expired. However, the Secretary of the Treasury is authorized to pay over the proceeds, after deducting all duties, charges, and expenses, to the consignee or owner of the goods. Until 1890 an additional duty of 10 per cent. was added to the original duty on imported goods which were allowed to remain in storage longer than one year, but the Tariff Act of that year, as interpreted by the Treasury Department, impliedly repealed this provision. It is obvious that, in the absence of express legislation, the duty or tax for which goods are liable is such as is in force and is levied at the time when the goods are received or produced, and that subsequent changes in the tariff, made while the goods are in bond, will not affect them. However, there is nothing to prevent Congress from subjecting merchandise on which the duty has not already been paid to the altered rate of a new tariff act, and this was, in fact, done in the case of distilled liquors, by the Tariff Act of 1894. Such liquors then in bond were expressly included within the terms of the increased internal-revenue tariff, and, in consideration thereof, the bonded period of such liquors was extended from three to eight years.

Inasmuch as duties and other revenue taxes are levied on goods imported or manufactured for home consumption, such taxes are withdrawn, even after having been once levied, from goods which are thereafter exported. Accordingly, there is nothing to prevent an importer who desires to avail

himself of a favorable change in the tariff, effected while his goods are in bond, from exporting those goods again and then reimporting them under the new rate. Of course this would be a profitable transaction only in the unusual event of a tariff reduction so great as to more than neutralize the cost of handling and shipping the goods twice over the route of exportation. The foregoing principle (exempting from duty goods imported for the purpose of exporting them again, has been extended, in a few cases, so as to permit the temporary withdrawal of merchandise from bonded warehouses for the purpose of treating it and changing its commercial form and then of re-exporting it. Thus metals imported for the purpose of smelting and refining and then of exporting the same may be withdrawn from bond without the payment of duty thereon. Such cases are exceptional, however, the general rule being that goods can not be withdrawn from store to make a change in their condition (as sugars to be refined), or for temporary use, and then returned. Thus in 1889 the Treasury Department was called upon to decide that the proprietors of a hippodrome could not be permitted to withdraw the hippodrome and its paraphernalia from bond for the purpose of exhibiting the same and then of exporting it again, and also that there was no authority under which the Madison Square Garden in New York could be made a bonded warehouse so as to allow the said hippodrome to be entered under bond for performance there.

The materials for a more detailed study of the warehousing system are to be found in the U. S. statutes at large and the decisions of the Treasury Department.

GEORGE W. KIRCHWEY.

Warfield, BENJAMIN BRECKENRIDGE, D. D., LL. D.: educator and author; b. at Lexington, Ky., Nov. 5, 1851; graduated at Princeton College 1871, at Princeton Theological Seminary 1876; studied at Leipzig University 1877; pastor of First Presbyterian church, Dayton, O., 1876–77; of First Presbyterian church, Baltimore, Md., 1877–78; instructor in New Testament Literature and Exegesis in Western Theological Seminary, Allegheny, Pa., 1878–79; professor of same 1879–87; became Professor of Didactic and Polemical Theology in Princeton Theological Seminary 1887; author of *The Divine Origin of the Bible* (Philadelphia, 1881); with Dr. Hodge, of *Inspiration* (Philadelphia, 1881); *Introduction to the Textual Criticism of the New Testament* (London and New York, 1886); *Augustine's Anti-Pelagian Treatises* (New York, 1887); *The Idea of Systematic Theology considered as a Science*, an inaugural address (New York, 1888); *On the Proposed Revision of the Westminster Confession* (New York, 1891); *The Development of the Doctrine of Infant Salvation* (New York, 1891); *The Canon of the New Testament* (Philadelphia, 1892); *The Gospel of the Incarnation* (New York, 1893); edited *Princeton Sermons*, chiefly by the professors in Princeton Theological Seminary; managing editor with Charles A. Briggs, D. D., of *The Presbyterian Review* (1889); managing editor since 1890 of *The Presbyterian and Reformed Review*.

Warfield, ETHELBERT DUDLEY, LL. D.: educator and author; b. at Lexington, Ky., Mar. 16, 1861; educated at Princeton, at Wadham College, Oxford, England, and in Germany; graduated at the law school of Columbia College, New York; admitted to the bar 1884; practiced law until called to the presidency of Miami University, Oxford, O., 1888; became president of Lafayette College, Easton, Pa., Sept., 1891. In both institutions he joined to the duties of president the headship of the department of history. Author of *The Kentucky Resolutions of 1798* (New York, 1887), and of various contributions to periodicals.

Waring, GEORGE E.: See the Appendix.

Warm-blooded Animals: those vertebrates possessed of warm blood, which is such simply by virtue of a complete circulation of the fluid, and its aëration through the medium of lungs at each revolution. The animals must consequently all breathe air direct, and this is done by the fish-like whales and porpoises as well as by the true terrestrial quadrupeds and birds. The only warm-blooded animals are the mammals and birds, and these were almost always associated by the older naturalists under the above name or its equivalents, *Calida animalia*, *Hæmatotherma*, etc. This combination is now known, however, not to be a natural one, inasmuch as the birds are much more nearly related to the reptiles than to the mammals, and the character combining them is a mere physiological adaptation for the same functions of life.

Warming and Ventilation: In cold and temperate climates the heating and the ventilation of buildings must be considered together, because the amount and arrangement of the heating surfaces depend largely upon the amount of ventilation to be provided for, and the arrangements for securing ventilation depend, to a considerable extent, upon the methods of heating employed.

By ventilation is meant a regular and continuous change of air in a room or inclosed space. The objects of ventilation are to remove offensive or dangerous gases, foul odors, dusts, and moisture, to supply oxygen, and to regulate temperature. As applied to human habitations and public buildings, it is intended to bring into a room the external air in sufficient quantity to dilute the products of respiration and exhalation of the occupants to a certain degree, and to remove from the room a corresponding quantity of the vitiated air. It is a very common idea that ventilation means simply the removal of foul air, and that if an opening, tube, or flue is provided for this purpose all that is necessary has been done. Most of the so-called patent ventilators are contrivances of this character. But it is the securing of the admission and proper distribution of a sufficient quantity of fresh air that is the real problem, and if this be done the getting rid of the foul air is a comparatively easy matter.

In the process of animal respiration, and in the combustion of wood, coal, oil, or illuminating-gas, a part of the free oxygen of the atmosphere combines with carbon, forming carbon dioxide. A certain amount of free oxygen is necessary for the maintenance of animal life, and when the proportion of this gas in the inspired air falls below this amount death rapidly follows. In 100 parts of ordinary free atmosphere there are about 20·96 parts of oxygen, 78 parts of nitrogen, 1 part of argon, and ·04 part of carbon dioxide, these gases being a mixture and not in chemical combination. In 100 parts of air expired from the human lungs there are about 16·03 parts of oxygen, 78·2 parts of nitrogen, 1 part of argon, and 4·77 parts of carbon dioxide. If a man be inclosed in an air-tight space and compelled to rebreathe the air which he has inhaled, the free oxygen continues to diminish and the carbon dioxide to increase until the oxygenation of the blood in the lungs, which is necessary to life, can no longer be effected, and death from suffocation follows. On the capture of Fort William, in Calcutta, in 1756, 146 Europeans were pressed into a chamber scarcely 20 feet square, with two small windows. The next morning only 23 were alive, and these were greatly exhausted. This incident of the "Black Hole of Calcutta," and a somewhat similar occurrence on the steamer Londonderry, when, out of 150 passengers confined in a small cabin for several hours, 70 died, illustrate the effects of air rendered excessively impure by respiration and bodily exhalations. A much smaller amount of such impurity in the air is sufficient to produce discomfort, and, if its inspiration is long continued, disease; but definite information is wanting as to the precise nature of the disorder which is thus produced, or as to what may be called the permissible limit of deterioration of the air. The vital statistics of soldiers living in unventilated barracks and of the occupants of crowded and ill-ventilated tenement-houses show that such persons have a high death-rate, due mainly to consumption, pneumonia, and other diseases of the lungs; but how far this is due to changes in the gaseous constituents of the air, and how far to increased risk of inhaling the bacteria of tuberculosis, pneumonia, etc., in such uncleanly localities, is uncertain. Carbon dioxide, in the proportion in which it is found in the most crowded barrack or lodging-room, does not appear to be, in itself, poisonous; at all events, it may be inhaled in such proportion for days together without producing any apparent effects, provided that the proportion of oxygen is nearly normal. It has been commonly supposed that expired air contains volatile organic matters which are poisonous, but careful experiments have recently shown that this is very doubtful so far as the lower animals are concerned, and that if such matters do exist in expired air it must be in extremely small quantity. The discomfort produced in crowded and badly ventilated assembly-halls appears to be largely due to excessive temperature and moisture, but it may also be in part due to changes in the composition of the air itself. In a railway-car running between St. Petersburg and Moscow, and carrying eighty third-class passengers, at the end of nine hours—with an outside temperature of −22° F., a temperature in the upper part of the car of 21° F., and at the floor of −6° F., the carbon dioxide being 94 per 10,000—a chemist could no longer endure the foul air, although the

peasants did not seem to be materially affected. The rule that is usually accepted is that when the air in a room occupied by human beings has a decidedly close and musty odor to a person coming in from the outside air—that air is so impure as to be probably injurious to health. Under ordinary circumstances of humidity and temperature such an unpleasant odor will exist when the proportion of carbon dioxide in the air has risen to 8 or 9 parts per 10,000. As the proportion of carbon dioxide in air can be measured with comparative ease and accuracy, such proportion is taken as the index of the other impurities, and it is generally agreed that this proportion should not exceed 7 parts in 10,000, while English sanitarians, following Parkes and de Chaumont, fix the limit at 6 parts in 10,000. An adult male gives off from ·6 to ·7 cubic foot, and a female from ·4 to ·5 cubic foot of carbon dioxide an hour, the mean for a mixed assembly being about ·6.

The amount of air-supply to be provided for a room depends on the purposes for which it is to be used—whether it is to be occupied for hours continuously, like a sleeping-room or hospital ward, or only for an hour or two. Assuming that no reliance is to be placed on cracks and crevices, and that the walls will be made practically air-tight by paper or paint, the following table shows the amount of air which should be supplied to different kinds of rooms to secure freedom from odor and satisfactory ventilation:

Character of rooms.	Cubic feet of air an hour.
Hospitals	3,600 per bed.
Legislative assembly-halls	3,600 " seat.
Barracks and bedrooms	3,000 " person.
Schools and churches	2,000 to 2,400 " "
Theaters and ordinary halls of audience	2,000 " seat.
Office rooms and dining-rooms	1,800 " person.

These quantities are nearly double the amounts usually supplied, but they are the quantities which should be used by the architect in calculating sizes of flues, registers, and heating apparatus for new buildings.

As a rule, the amount of air required for diluting the products of respiration is also sufficient to maintain combustion of fires and lights; but if the number of lights be large in proportion to the number of persons, a special supply of air for them may be desirable; 1,000 cubic feet of air per hour per gas-burner is sufficient. Electric lights require no provision for air-supply.

Men require fresh air not only for respiration, but to carry off the heat which they produce, and the warmer and moister the air the more is required to secure comfort. In a hot, moist day without wind, sufficient ventilation can not be secured out of doors. Ventilation implies movement of air due to some force, usually that due to differences in weight of two adjacent columns of air, such difference being due to differences in temperature. Air expands about $\frac{1}{491}$ of its volume for each degree Fahrenheit, or $\frac{1}{273}$ of its volume for each degree centigrade, that it is heated; and the cause of the ascent of warm air in a flue is the greater weight of the column of outside air of the same height, but of a lower temperature, and therefore denser and heavier, which falls toward the opening at the bottom of the flue and pushes upward the warmer and lighter air. The differences in pressure between the two columns in any given case are indicated by the velocity with which the warm air ascends, and this, in feet per second, is equal to $8\sqrt{\frac{(t-t')h}{491}}$, in which t is the temperature of the warm air in the flue, t' the temperature of the colder air outside, both in degrees Fahrenheit, and h the height of the flue in feet.

The velocity thus determined is the theoretical velocity, and the real velocity is usually from 20 to 30 per cent. less. Knowing the velocity and the area of the cross-section of the flue, the quantity of air that is passing up is easily determined. The cause of wind is the same as that of the current at the base of a heated flue.

The ventilation which is produced by currents of air due to wind, or by the warming of the air by ordinary heating apparatus, is called natural ventilation; while that which is produced by power which is independent of the heating apparatus or of wind, and which is applied expressly for the purpose, is called artificial or forced ventilation. Forced ventilation may be produced by heating, the air in the outlet flue or chimney being expanded and rarefied by means of coils of steam-pipe, called accelerating coils, or by gas-jets, or by small furnaces, and the velocity of the air-current being thus increased as well as the aspirating power at the openings into the flue from the rooms to be ventilated; or it may be produced by fans or blowers driven by steam or water power, or by inducing currents of air by means of jets of steam, or of compressed air, or by a stream of falling water. In seasons when artificial heat is not required, the wind is one of the most powerful and useful means of ventilation, since an enormous amount of air is moved by a gentle wind acting through open windows and doors; but it is irregular in its action, and often fails when it is most needed.

Systems of Artificial Ventilation.—While natural ventilation is still relied upon for almost all dwelling-houses, engineers are resorting more and more to the use of some form of fan or blower to insure and regulate the proper flow of air in schools, hospitals, theaters, and other large buildings where many persons are assembled. Such fans or blowers are often so placed as to force a current of air through a series of coils of steam-heated pipes, and thence through galvanized iron ducts to the rooms which are to be warmed, forming what is known as a hot-blast system. Such fans are usually comparatively small, are run at high speed, and, to save expense, the ducts are made as small as possible, thus necessitating considerable velocity in the currents passing through them to furnish the requisite supply. This involves great loss of force from friction, especially in the smaller ducts, and what is gained in cheapness of first cost of construction by making the fan and flue small is much more than lost in a few years by the increased consumption of fuel to furnish power. As a general rule, air-flues, especially the smaller ones, should have such dimensions that the requisite amount of air may be obtained through them with a velocity of not more than 480 feet per minute, and a velocity not to exceed 400 feet per minute is more economical in the long run. In an ordinary chimney-flue, without a forced draught, the velocity of the ascending current averages about 6 feet per second.

When the air is forced into a room by means of a fan or blower it is called a plenum system, and this is what is usually employed for halls of assembly. When the air is drawn from the room by a fan or heated chimney, it is called an aspirating system. Sometimes both systems are employed together. As electricity has become more available as a source of power, the use of small electric aspirating fans is increasing, and they may often be made useful; but to effect a really useful change of air they must have some opening for discharge of air outside the room, because if they are used merely to stir the air and produce a current in the room they contribute nothing to its ventilation.

Methods of Warming Buildings.—The artificial heating of a room or building is effected in several different ways, technically known as direct radiation, indirect radiation, and direct-indirect radiation, or by combinations of these. In heating by direct radiation the heating surfaces are placed in the room to be warmed, and are not connected with the air-supply. This includes fireplaces, ordinary stoves (see STOVE), pipes, or radiators placed in the room and heated by steam, hot water, or electricity, and methods of heating the walls and floors of a room as a mass. Of these the fireplace, or open grate, is the only one which really heats entirely or mainly by radiant heat, in which the heat passes in straight lines through the air until it is intercepted by some solid or liquid, which it warms. Such heat does not appreciably warm the air through which it passes. Much the greater part of the heat furnished by stoves and heated pipes or other surfaces is convected heat—that is, heat conveyed by particles of air which come in contact with the hot surface and then pass off in currents, conveying this heat to the colder surfaces in the room against which they strike. Heating by indirect radiation is the heating by hot air, which air has been warmed by heating surfaces placed in some other room, usually in the basement or cellar, and which are heated either directly as in a furnace, or by steam or hot water. In heating by direct-indirect radiation the heating surfaces are placed in the room to be warmed, but are so arranged, usually against the outer wall or beneath the windows, that fresh cold air is brought in around them in order that it may be warmed.

Direct-radiation heating by means of fireplaces is the cheapest as regards construction, but much the most costly as regards fuel. It is an agreeable and desirable addition to other means of heating, furnishes a good outlet flue, and should be placed in all sitting-rooms and bedrooms; but it is dangerous, and is now rarely relied upon as the sole source of heat.

Direct-radiation heating by means of steam is now more used in large buildings than any other, because the apparatus is cheaper to construct than that for steam or hot water indirect radiation, and can also be run with less cost if there is little or no fresh air to be heated.

The great majority of small dwelling-houses in the U. S. are heated by stoves, and have no provisions for ventilation. In houses of a somewhat better class the hot-air furnace is very commonly employed, and of this there are many patterns. As a rule, they are too small, and in very cold weather the heating surfaces must be raised to a high temperature to secure comfort, the joints soon become leaky and allow carbonic oxide and sulphur compounds to pass into the air-supply, which is excessively hot and dry, and is apt to produce headache, languor, and unpleasant sensations of various kinds. As furnaces are usually set, the only way to prevent the room from becoming too warm is to shut off the air-supply of the room. The source of the fresh-air supply to a furnace is often unsatisfactory, and is contaminated with cellar air. So far as comfort and health are concerned, the best mode of heating a first-class dwelling-house, or a hospital, is by indirect radiation from surfaces heated by water to a temperature not to exceed 180° F., and usually not exceeding 150° F. The object of this method is to warm all the air required for heating and ventilation to the temperature desired and no more. In steam heating with ordinary forms of radiators, the temperature of the radiators must be about 210° F. while steam is circulating, hence the air must be heated more than is desirable, and the requisite temperature obtained by mixture with cooler air. As a hot-water apparatus must have a greater amount of radiating surface and larger flow and return pipes than one for steam, it is more expensive, the extra cost being from 25 to 35 per cent.; but, on the other hand, it uses less fuel, and requires less skilled management.

The force which produces the circulation in a hot-water apparatus is very slight, being merely the difference in weight of two columns of water, one of which is from ten to twenty degrees warmer than the other; the boiler must be at the lowest part of the system, and the grades of the pipes must be uniform. In a steam apparatus the boiler may, if necessary, be higher than some of the heating surface, and accurate gradation of the pipes, while desirable, is not essential. Where steam-power is required for machinery, elevators, dynamos, etc., the waste steam from the engine can often be usefully employed for heating.

A steam-heating apparatus is a little more dangerous than a hot-water one, although the difference may be small; and it is much more apt to produce unpleasant noises and jarring, technically known as "water-hammer," but this can be avoided if the apparatus be properly constructed. The differences in steam-heating plants are very great as to efficiency, durability, original cost, and cost of running, and those which are cheapest at first often prove to be much the most expensive in the end. The covering of boilers and of steam-pipes in places where heat is not wanted, as in cellars and basements, with some non-conducting material, such as asbestos or magnesia, is an important matter for saving fuel, especially in large plants with much surface in the supply and return mains.

A steam or hot-water heating apparatus is composed of radiators, supply and return pipes, and boiler. The amount of radiating surface required to heat a room is computed in various ways. If direct radiation only is called for, and no provision to be made for fresh air, the rule of thumb of the shops is to allow 1 sq. foot of radiating surface to each 100 cubic feet of space to be heated. In heating by indirect radiation the amount of radiating surface is to be doubled. A much better way is to calculate for both loss of heat through windows and walls, and for heating the air-supply required. Taking the thermal unit as the amount of heat required to raise 1 lb. of water from 50° to 51° F., the external temperature as zero F., and the internal temperature of the room as 70° F., the number of thermal units transmitted each hour through each square foot of surface is approximately as follows: Windows, 55; doors, 29; brick wall 12 inches thick, 22; brick wall 12 inches thick, plastered, 12; same, hollow wall, 16 inches thick, or furred out and plastered, 7.

In a well-constructed dwelling-house, school, church, or hospital, the loss of heat through 1 sq. yard of wall may be taken as equal to that through 1 sq. foot of glass—it being, in fact, a little more. The amount of heat given off each hour from 1 sq. foot of steam-heated radiating surface in a room at 70° F. is about 130 thermal units, or a little more than enough to supply the heat lost through 2 sq. feet of window surface with the external temperature at zero. For a stove or furnace 1 sq. foot of radiating surface is usually reckoned as equal to 6 sq. feet of steam-heated surface at 210° F. Hence the rule: Take the number of square feet of window surface plus the quotient of the number of square feet in the outer walls divided by 9, and multiply this by $\frac{7}{18}$ for hot water or by $\frac{1}{2}$ for steam; supposing the lower temperature of the outside air to be zero F., the product is the number of square feet of radiating surface required to keep the room at 70° F., with no allowance for change of air. For air-heating, multiply the number of cubic feet of air to be heated in each hour by the number of degrees Fahrenheit to which it is to be heated, and divide the product by 12,500. The quotient is the number of square feet of radiating surface required.

The heat which passes off through walls and windows produces no useful effect, and involves a necessary waste; but the heat which passes off with the warmed air, however it may have been warmed, is doing good work if it causes the movement of this air required for ventilation. If, however, the warmed air is removed by a fan, its heat is also wasted. When chimneys and upcast flues are placed in outside walls there is waste of heat.

In heating dwelling-houses and the majority of other buildings, by steam, what is called a low-pressure apparatus should be used. By this is meant that the maximum pressure at the boiler shall not exceed 10 lb. to the square inch; that a pressure of 1 lb. to the square inch shall give a complete circulation of steam throughout all pipes and radiators; and that the condensed water shall flow back by gravity to the boiler, which must, therefore, be below the level of the lowest radiators. In a one-pipe system the condensed water passes down in the same vertical pipe in which the steam ascends; in a two-pipe system the water returns in an entirely distinct system of pipes; and this is much the best, although the one-pipe system is the cheaper. The supply-pipe, or main, being that which conveys the steam from the boiler to the radiators, should rise as soon as possible after leaving the boiler to the highest point to which it is necessary to carry it, and from this point should begin to slope downward to the most distant radiator and the connection with the return-pipe, which, in its turn, should steadily descend to the boiler. This is to insure that the steam and condensed water in the pipes shall always move in the same direction.

To secure a satisfactory circulation with low pressure the supply-main must be comparatively large, the usual rule being that its diameter in inches should equal one-tenth of the square root of the number of square feet of radiating surface which it is to supply. The return-pipe for condensed water may be smaller than the flow-main. There are many kinds of boilers for steam-heating in the market. For plants which supply 1,500 or more square feet of radiating surface, the ordinary horizontal flue boiler is in most cases preferable, because it wears well, and is easily cleaned and repaired by ordinary workmen. If a part in a patent boiler gives way it may be difficult and expensive to replace it.

For small dwelling-house plants, however, some of the forms of vertical boilers with drop tubes answer very well, and take up much less floor space than the horizontal form. If heating from a zero temperature is to be provided for, the boiler should have 1 sq. foot of heating surface to each 6 sq. feet of the radiating surface which it is to supply.

When exhaust steam from an engine is to be used for heating, a back-pressure valve is placed in the exhaust-pipe, and from below this valve a pipe is taken through a grease separator to the pipe supplying the radiators, which are arranged for a low-pressure system. Reference has been made above to the hot-blast system of heating, in which a fan or blower is used to force air through a single centralized coil or stack of radiators. This is one of the cheapest systems so far as cost of plant is concerned, because by concentrating the radiating surface, the cost of connecting mains and returns is much diminished; it does not take up much room in the basement, and hence it is a favorite system with contractors. It is most applicable to buildings which are to be occupied for only a few hours at a time; but it is not an economical apparatus for hospitals, asylums, prisons, or other buildings which are to be constantly occupied.

Some of the practical applications of the above statements

with regard to warming and ventilation will now be considered. In the great majority of buildings heated by direct radiation only, whether by stoves or steam, no special provision is made for fresh-air inlets; but in a few the fresh air is admitted through tubes or ducts arranged so that in winter the cold air shall enter the room in an upward direction, and mingle with the warm air at the top of the room before it comes in contact with the persons of the occupants.

If the floor of a room be constructed of brick, cement, tiles, etc., in such a way that it can be warmed as a whole, after the manner of the Roman hypocaustum, or as is done in some of the wards in the Hamburg Eppendorf Hospital, it is possible to maintain comfort while air at about 50° F. is supplied for respiration; but such arrangements are costly, and there is no evidence that they are more comfortable or healthful than the method of heating by indirect radiation with a large air-supply. In deciding on the position of fresh-air inlets to a room it is important to remember that air, like other fluids, has a decided tendency to adhere to the surfaces with which it comes in contact. When a jet or stream of air strikes a wall or floor it does not rebound from it as a ball would do, but spreads out over it, as a stream of water does. If the surface is of limited extent, the atmospheric pressure on the opposite side of the surface is diminished, as may be seen by holding a card near a candle and blowing obliquely against the card. The flame of the candle will be drawn toward the card. In like manner, if the wind blow strongly against the north side of a house, all openings on the south side are under diminished atmospheric pressure, and may become outlets for the air in the house, although intended to serve as inlets. Under such circumstances a furnace may work backward, as it is said, and a direct-indirect radiator on the lee side of a room may draw air from within and discharge it outside, thus tending to cool rather than to warm the room. The mouth of the air-duct of a hot-air furnace should therefore be on what is usually the windward side of the house in cold weather, and the inlets to radiators should be lessened or closed when they are on the leeward side in a strong wind.

As a rule, in heating by indirect or by direct-indirect radiation the air-supply is taken at the nearest point directly from the exterior of the building; but in cities, if the opening is near the ground on the street, the air is liable at times to contain much dust, and may become contaminated with sewer air. For some large buildings, such as assembly-halls, hospitals, etc., a special single inlet in the form of a shaft or tower is sometimes provided, the air being drawn down it by mechanical means. Such a shaft should usually be about 25 feet high.

Sometimes provision is made for the filtration of the incoming air in order to remove soot, dust, and fog, and this is specially desirable for chemical and bacteriological laboratories, and for picture-galleries and libraries. This can be done by screens covered with coarse cotton cloth, or, for a large building, by drawing the air through a water spray or a moistened screen, as is done in the Glasgow Infirmary. Dry filtration causes much less obstruction to the air-current than a wet screen, and hence the dry screen may be smaller, but it must be changed more frequently.

The position of fresh-air inlets within the room depends largely upon the purpose for which the room is to be used, and must be considered in connection with the position of outlets and the means employed to secure the movement of the air. In dwelling-houses heated by indirect radiation the inlets for warm air are usually in the floor or near the floor in a chimney, while the outlets are also near the floor, being open fireplaces or grates. This secures a fairly good circulation in rooms occupied by but few persons, the warm air rising to the top of the room and slowly descending to take the place of the air which has been cooled by windows and walls and is being drawn off through the chimney-flue. It is, however, not desirable to place fresh-air inlets in floors, because the dust and dirt from the floor is continually falling into the fresh-air ducts through these inlets, and is being returned in the air-currents.

A current of air with a velocity of 1½ feet per second is not perceptible unless it is very cold or very warm, while a current of 2 feet per second is just perceptible at ordinary temperatures; and therefore this is usually taken as the limit of the velocity which a current issuing from a fresh-air opening should have if any one is to be seated where it will strike him. If we allow three-quarters of a cubic foot of air per second per person (2,700 cubic feet per hour), it follows that to obtain the requisite supply with a velocity of 2 feet per second there must be a register opening equal to 0·37 sq. foot, or a little over 53 sq. inches per person. As about one-half of the surface of an ordinary register is occupied with ironwork it follows that 100 sq. inches of register surface per person would be requisite at this velocity, and that in a schoolroom containing thirty-six children the fresh-air registers, if placed near the floor, would occupy 25 sq. feet of surface. In schoolrooms or other rooms occupied by a number of persons it is usually better to place the fresh-air inlets at a height of about 6 feet from the floor, and let the air pass through them with the same velocity that it has in the flues, viz., about 6 feet per second. In hospitals, however, it is better to put the fresh-air inlets in the wall near the floor, in order to be able to control the temperature in the vicinity of each bed to a certain extent. In winter the position of the outlets should usually be near the floor, for reasons given above; but in summer the outlets should be near the top of the room to allow the heated impure air to escape as rapidly as possible. The size of the outlets should be calculated for a velocity of air-current of from 4 to 6 feet per second. To prevent loss of heat, and consequent checking of draught, vertical foul-air flues should be placed in interior walls as far as possible, and each should have two inlets from the room which it is to serve, one near the floor and the other near the ceiling. Both inlet and outlet flues should have smooth surfaces, and to secure this they are often lined with tin or light galvanized iron.

With the exception of coal mines, the ventilation of which is often peculiar, the most difficult problems in heating and ventilation relate to large assembly-halls in which a number of persons are seated on the floor and in the galleries. The fresh air for those seated near the center of the room should be brought either from below or from above, and not by lateral currents passing over the bodies of other persons and thereby becoming contaminated with their exhalations. To avoid unpleasant draughts the air-currents which may strike a person must not have a velocity of over 2 feet per second. The increase of temperature and moisture of the air from the bodies of persons in the room must be met by arrangements for furnishing cooler air after the audience has assembled and the room is thoroughly warmed. Illumination should be by electric lights, or, if gas must be used, ample facilities should be provided for the escape of the heated and impure air from such lights. It is to be remembered that the waves of air which transmit sound are not only retarded if they travel against an air-current, but that they become confused and irregular in passing through layers of air of different densities. In assembly-halls in which the speaker occupies one part of the room only, as in churches and theaters, the air should be so introduced that there shall be a constant and uniform current from the speaker toward the audience; but in legislative halls, where the speaker may occupy any part of the room, care is to be taken to secure as far as possible air of a uniform temperature moving in the same direction throughout the lower part of the room, and especially to avoid local columns of heated air rising from registers in the floor. Finally, no system of ventilation can be made to give entire satisfaction unless operated by a thoroughly competent manager. J. S. BILLINGS.

Warneck, GUSTAV ADOLF: See the Appendix.

Warner, town (founded in 1735); Merrimac co., N. H.; on the Boston and Maine Railroad; 18 miles N. W. of Concord (for location, see map of New Hampshire, ref. 8–E). It contains the villages of Warner, Roby's Corner, Melvin's Mills, Waterloo, and Davisville; has two churches, high school, Pillsbury Free Library, and a weekly newspaper; and is principally engaged in lumbering and in the manufacture of gloves and mittens. Pop. (1900) 1,358.

EDITOR OF "KEARSARGE INDEPENDENT AND TIMES."

Warner, CHARLES DUDLEY: author; b. at Plainfield, Mass., Sept. 12, 1829; graduated at Hamilton College 1851; in 1853 and 1854 was a member of a surveying party in Missouri; studied law in New York; was admitted to the bar in Philadelphia 1856; practiced in Chicago until 1860, when he became assistant editor, and in 1861 editor, of the Hartford *Press* (consolidated in 1867 with the Hartford *Courant*). He has traveled much, and has published several volumes of travel, humorous sketches, essays, novels, and other writings, including *My Summer in a Garden* (1871); *Saunterings* (1872); *Back-log Studies* (1872); *The Gilded Age* (with S. L. Clemens, 1873); *Baddeck and That Sort of Thing* (1874); *Mummies and Moslems* (1876); *In the Levant* (1876); *In the Wilderness* (1878); *Washington Irving*

(1881); *Their Pilgrimage* (1886); *On Horseback* (1888); *A Little Journey in the World* (1892); and *The Golden House* (1894). He conducted the Editor's Drawer in *Harper's Magazine* 1884–92; then succeeded William D. Howells as conductor of the Editor's Study. D. Oct. 20, 1900.

Warner, SETH: soldier; b. at Roxbury, Conn., May 17, 1743; settled at Bennington, Vt., 1765; was a leader of the "Green Mountain Boys" in the conflicts of jurisdiction with the New York authorities, by whom he was outlawed; was second in command to Ethan Allen at the capture of Ticonderoga and Crown Point 1775; was chosen colonel of Vermont troops July 27, 1775; took part in Montgomery's campaign in Canada; rendered good service in the retreat to Ticonderoga May, 1776; commanded in a sharp engagement at Hubbardton July 7, 1777; participated in the battle of Bennington, and continued in the service until 1782, when he retired because of ill health, and returned to Roxbury, Conn., where he died Dec. 26, 1784. A *Memoir* by Daniel Chipman was published at Middlebury in 1848.

Warner, SUSAN: novelist; b. in New York, July 11, 1819; published *The Wide, Wide World* (1850), a novel which had great success in both Great Britain and the U. S., reaching a sale of 250,000 copies in the U. S. alone; *Queechy* (2 vols., 1852); *The Hills of the Shatemuc* (1856); a volume of *Lyrics from the Wide, Wide World*; *The Golden Ladder* (1862); *The Old Helmet* (1863); *Wych Hazel* (1876); and other works, among which are a theological treatise of some importance, *The Law and the Testimony* (New York, 1853), and an essay on *American Female Patriotism*. She published her novels under the pen-name of Elizabeth Wetherell. D. at Highland Falls, N. Y., Mar. 17, 1885.—Her younger sister, ANNA BARTLETT, b. in New York in 1820, also acquired a name as a novel-writer. Among her works are *Dollars and Cents* (2 vols., New York, 1853), a representation of political life in America at that time; *My Brother's Keeper* (2 vols., 1855); *Mr. Rutherford's Children* and *Stories of Vinegar Hill* (6 vols., 1871). She wrote under the name Amy Lothrop.

Revised by H. A. BEERS.

Warner, WILLIAM: poet; b. in Oxfordshire, England, about 1558; educated at Magdalen College, Oxford: became an attorney, and is supposed to have spent most of his life as business agent of Henry Carey, Lord Hunsdon. He was the author of *Pan, his Syrinx* (1584), a pastoral novel, and *Albion's England, a Continued History of the same Kingdom from the Originals of the First Inhabitants thereof*, etc. (1586), a long poem in rhymed fourteen-syllable lines, and combining history, legend, and anecdote, which enjoyed contemporary popularity, passing through nine editions, the last of which was in Chalmers's series (1810). D. at Amwell, Hertfordshire, Mar. 9, 1609. H. A. B.

War of Succession: See SUCCESSION WARS.

Warrant: any one of various writs, precepts, or writings by which a person or court legally authorizes or directs a person or officer to do some act; specifically, an order or writ or process (which must be under seal unless the use of a seal has been dispensed with by statute) issued by some court or justice or officer having authority so to do, authorizing and directing the person to whom it is addressed to arrest or take some person named therein and bring him before a court, judge, or magistrate for examination, trial, or sentence, or otherwise legally dispose of him, or to take certain goods named, or to search for the person or property named and take the same. A warrant issued by a court is called a *bench warrant*, and such warrants are generally used for the purpose of apprehending a criminal who is at large either on bail or otherwise for an examination, indictment, or trial, or when he has committed an offense in the presence of the court. A warrant to discharge from prison a person who has been bailed is called a *warrant of deliverance*. A warrant authorizing the levy of a penalty by distress and sale of goods is called a *warrant of distress*. There are various other species of warrants.

The *issuing of warrants* is mostly regulated by statute both in Great Britain and in the U. S. In Great Britain a warrant of arrest may be granted in case of treason or other like offense by the privy council or by one of the secretaries of state, and in case of any person charged with a felony, by any judge of the Queen's Bench Division of the High Court of Justice; and under statutory provisions—48 Geo. III., c. 58 (c)—any such judge may grant the warrant in certain specified cases in order that a person charged with an offense which may be prosecuted by indictment or information (on being satisfied that the indictment or information has been found or filed) may be held to bail or committed to trial. But in the ordinary case the writ is issued by a justice of the peace out of sessions under the statute 11 and 12 Vict., c. 42 (c), by which act it is provided in general that when a charge or complaint is made before any justice of the peace, alleging that any person has committed or is suspected of having committed any treason or felony or any indictable misdemeanor or offense, and is, or is suspected to be, within his jurisdiction, such justice may issue to the constable or other peace officer of the county or jurisdiction a warrant for his apprehension, and may cause him to be brought before him or some other justice to answer and to be dealt with according to law. A justice of the peace may also issue a warrant for search for stolen goods. A warrant from any judge of the Queen's Bench Division of the High Court of Justice extends over all England; but the warrant of a justice extends only over one county, although it may be executed in any other county if simply "backed" or indorsed by a justice of that county, by a custom which long prevailed and was finally authorized by 11 and 12 Vict., c. 42, and 14 and 15 Vict., c. 55, s. 18. Warrants issued in England or Wales are backable in Scotland, Ireland, or the Channel islands, and *vice versa*. A summons may be issued instead of a warrant, and may be granted on a parol or unsworn information or complaint, unlike a warrant, which must be upon information or complaint in writing and under oath except when the offense was committed in the presence of the court. In the U. S. the statutes of the various States vary in details, but the general procedure is essentially the same as in Great Britain, the ordinary warrant being obtained from a justice of the peace or other magistrate of corresponding jurisdiction upon a sworn complaint or information.

The officer receiving the warrant is bound to execute it in any place to which the jurisdiction of the magistrate and himself extends, and he may break open doors in order to execute it in case of treason, felony, or other indictable offense, provided that no admittance can be obtained on demand, and there is in these cases no immunity from arrest either in the night-time or on Sunday. The officer must make return of what he has done, either that he has executed the warrant partially or completely as directed or has been unable so to do by reason of failure to find the person or property named or for some other reason. The illegal or oppressive issuing of warrants has given rise to some of the gravest questions and conflicts in English history. General warrants have never been recognized as legal in England, except that under the acts regulating the press a practice obtained in the office of the Secretary of State of issuing general warrants to take up (without mentioning any persons in particular) the authors, printers, and publishers of obscene or seditious libels mentioned; but in a case which arose in 1763 the court said they were void, and such general warrants were expressly declared to be illegal by a vote of the House of Commons in 1766. The constitutions of most of the States and the Constitution of the U. S. provide that general warrants shall not be issued. See the articles on ARREST, SHERIFF, JUSTICE OF THE PEACE, etc.

Warrant of attorney was formerly the same as POWER OF ATTORNEY (*q. v.*). This expression is now the general term, both in England and in the U. S., for a written authority addressed by a person to an attorney specified (in England an attorney of the court to which it is intended that judgment shall be entered up), or to any attorney, authorizing the attorney to appear for him in an action brought, or to be brought, and confess judgment in favor of some person named, or suffer the judgment to go by default. When given after the action has been commenced a warrant of attorney is distinctively called a COGNOVIT ACTIONEM (*q. v.*). The giving of a warrant of attorney is generally regulated and restricted by statute. In England an attorney of one of the superior courts must be present and advise the person giving it, and must subscribe his name to show due execution thereof, and the warrant must be filed in court within twenty-one days. In the U. S. in some States judgment by confession or warrant of attorney is not-allowed; in others it is allowed, but regulated and more or less restricted by statute.

See Archbold's *Criminal Practice and Pleading*; Archbold's *Criminal Pleading and Evidence*; Bishop's *New Criminal Procedure*; Stephen's *Commentaries on the Laws of England*; Alison's *Practice of the Criminal Law of Scotland*. F. STURGES ALLEN.

Warranty [from O. Fr. *warantie*. See GUARANTY]: in law, a name given to a class of agreements which are always based upon and collateral to some other and principal contracts. There are three distinct species in common use to which the term is applied.

Warranty on the Sale of Land.—This is an express covenant contained in a deed of conveyance, whereby the grantor binds himself and his representatives to warrant and defend the grantee, his heirs and assigns, in the quiet and peaceable possession of the land conveyed against any one claiming the same by a title paramount to that of the grantor. Another form protects the grantee against persons only claiming under the grantor himself. This covenant does not purport to guard the grantee against the acts of mere trespassers, or of those who have no valid superior claim to the land; it becomes operative against the grantor only when the grantee or his assigns are evicted, either in fact or in contemplation of law, from the premises or a portion thereof, by virtue of a valid paramount title or outstanding prior incumbrance. See COVENANT and DEED.

Warranty on the sale of chattels is discussed in the article on SALE (*Condition and Warranty*).

Warranties in Policies of Insurance.—These are stipulations by the assured which constitute the conditions upon which the policy is issued. See INSURANCE (*The Policy and Representations and Warranties therein*).

Revised by FRANCIS M. BURDICK.

Warren: village; Jo Daviess co., Ill.; on the Chi., Mil. and St. Paul and the Ill. Cent. railways: 26 miles N. W. of Freeport, 27 miles E. by N. of Galena (for location, see map of Illinois, ref. 1–C). It is in a lead-mining, tobacco-growing, stock-raising, and agricultural region, and has Methodist Episcopal, Presbyterian, Free Baptist, and Roman Catholic churches, high school, academy, public library, a private bank, 2 weekly newspapers, large creamery, and steam flour-mill. Pop. (1890) 1,172; (1900) 1,327.

EDITOR OF "SENTINEL."

Warren: town (founded in 1833); Huntington co., Ind.; on the Salamonie river, and the Tol., St. L. and Kan. City Railroad; 14 miles S. by E. of Huntington, the county-seat (for location, see map of Indiana, ref. 4–F). It is in an agricultural, natural-gas, and petroleum region, and has 3 churches, a public school, a private bank, 2 weekly newspapers, manufactories of flour, lumber, and hoops, and large grain, corn, hay, and live-stock interests. Pop. (1880) 503; (1890) 1,120; (1900) 1,523. EDITOR OF "REPUBLICAN."

Warren: town; Knox co., Me.; on the St. George's river, and the George's Val. and the Maine Cent. railways; 9 miles W. of Rockland (for location, see map of Maine, ref. 9–D). It was formerly known as the Upper Town of St. George, was known as a trading-post as early as 1631, settled in 1736, and incorporated in 1776. The town contains the villages of Warren, North Warren, South Warren, West Warren, Pleasantville, Highlands, and East Waldoboro; is in a limestone region; has good power for manufacturing; and contains 2 churches, high school, public library, and 2 hotels. Pop. (1880) 2,166; (1890) 2,037; (1900) 2,069.

Warren: town (incorporated in 1834); Worcester co., Mass.; on the Quaboag river, and the Boston and Albany Railroad; 26 miles N. E. of Springfield, 28 miles S. W. of Worcester (for location, see map of Massachusetts, ref. 3–F). It contains the villages of Warren and West Warren; has 6 churches, high school, 23 district schools, public library with about 9,000 volumes, a savings-bank, and a weekly newspaper; and is principally engaged in dairying and the manufacture of cotton and woolen goods, stationary engines, and steam-pumps. Pop. (1880) 3,889; (1890) 4,681; (1900) 4,417. EDITOR OF "THE WARREN HERALD."

Warren: city (founded in 1799); capital of Trumbull co., O.; on the Mahoning river, and the Erie, the Penn., and the Pitts. and W. railways; 14 miles N. W. of Youngstown, 52 miles S. E. of Cleveland (for location, see map of Ohio, ref. 2–J). It is in an agricultural, coal-mining, iron-mining, and dairying region, and has 7 churches, 10 stone and brick school buildings, electric lights, electric street-railways, improved water and sewerage plants, 3 national banks with combined capital of $350,000, a State bank with capital of $50,000, a monthly, 2 daily, and 3 weekly periodicals, flour, rolling, and planing mills, machine-shops, tin and wood novelty-works; and electric-lamp factories. Pop. (1880) 4,428; (1890) 5,973; (1900) 8,529.

EDITOR OF "CHRONICLE."

Warren: borough; capital of Warren co., Pa.; on the Alleghany river, and the Dunk., Alle. Val. and Pitts., the Penn., and the West N. Y. and Penn. railways; 29 miles E. by S. of Corry, 35 miles N. E. of Titusville (for location, see map of Pennsylvania, ref. 2–C). It is the center of the oil-trade of a large region, and has Presbyterian, Methodist Episcopal, German Methodist, Lutheran, Roman Catholic, Scandinavian, and other churches, 4 public schools, a parochial school, 3 national banks with combined capital of $350,000, a State bank with capital of $100,000, 3 daily and 4 weekly newspapers, iron-works, foundries, and machine-shops, table-factory, curative-oil works, and a consumption cure. The village of Glade was annexed in 1895. Pop. (1880) 2,810; (1890) 4,332; (1900) 8,043.

EDITOR OF "MIRROR."

Warren: town (incorporated in 1746–47); Bristol co., R. I.; on Narragansett Bay, and the N. Y., N. H. and Hart. Railroad; 10 miles S. E. of Providence (for location, see map of Rhode Island, ref. 8–O). It has an excellent harbor, cotton, braid, and twine factories, the George Hale Free Library, three national banks with combined capital of $480,000, a savings-bank with deposits of over $1,000,000, and a weekly newspaper. Pop. (1880) 4,007; (1890) 4,489; (1900) 5,108.

Warren, FRANCIS E.: politician; b. in Hinsdale, Mass., June 20, 1844; received an academic education; enlisted in 1862 in the Forty-ninth Massachusetts Volunteers, and served as private and non-commissioned officer in that regiment till it was mustered out of the service; was afterward captain in the Massachusetts militia; was engaged in farming and stock-raising in Massachusetts till early in 1868, when he removed to Wyoming (then a part of Dakota); was president of the council, Wyoming Legislature, in 1873, and member of the council in 1884; was mayor of Cheyenne, and served as treasurer of Wyoming; was a delegate to the national Republican convention in Chicago in 1888; was appointed Governor of Wyoming by President Arthur and removed by President Cleveland; was again appointed Governor of Wyoming by President Harrison and served till the Territory was admitted as a State, when he was elected Governor Sept. 11, 1890; was elected to the U. S. Senate in 1890 and was re-elected in 1895.

Warren, GOUVERNEUR KEMBLE: soldier; b. at Cold Spring, N. Y., Jan. 8, 1830; graduated at the U. S. Military Academy July 1, 1850, and entered the Corps of Topographical Engineers; was employed on surveys of the delta of the Mississippi river 1850–53; topographical engineer of Sioux expedition 1855; in charge of surveys, and preparing reports and maps thereon, of Dakota and Nebraska Territories 1855–59, in connection with the Pacific Railway exploration; Assistant Professor of Mathematics at West Point 1859–61; lieutenant-colonel of the Fifth New York Volunteers May, 1861. Promoted colonel of his regiment in August, he served in the construction of the defenses of Baltimore until the spring of 1862, when his command was united with the Army of the Potomac. He was assigned to the command of a brigade in the Fifth Corps in May, 1862, and distinguished himself at Gaines's Mills (for which he was promoted brigadier-general of volunteers Sept. 26, 1862), Malvern Hill, Manassas, and Fredericksburg. In 1863 he became chief topographical engineer under Hooker, which place he held until after the battle of Chancellorsville, when he was made chief engineer of the Army of the Potomac. At the battle of Gettysburg he seized Little Round Top, the key to the entire national position, was wounded, and breveted colonel U. S. army for gallant and meritorious services. He was now promoted major-general of volunteers to date from Chancellorsville, and Aug. 12 assigned to command of the Second Corps. In Mar., 1864, the First Corps was united with the Fifth Corps and Warren assigned to this command, which he held through the campaign of 1864, participating with most marked ability, energy, and gallantry in all the battles from the opening of the Wilderness campaign through the siege of Petersburg, and until the close of the battle of Five Forks (Apr. 1, 1865), when he was deprived of his command by Sheridan, owing to an unfortunate misunderstanding between them; was assigned Apr. 2 to the command of the troops between the Appomattox and the James, and Apr. 3 placed in command of Petersburg. Ordered to command the department of the Mississippi May 14, he held this till May 27, when he resigned his volunteer commission, and was breveted major-general for gallant and meritorious service in the field. Returning to duty as major of engineers, to which rank he had

attained June, 1864, he had charge of various harbor and river improvements, bridge constructions and investigations, and fortifications in course of construction and modification, and on other works of survey, improvement, and construction. He was promoted lieutenant-colonel of engineers Mar., 1879. D. at Newport, R. I., Aug. 8, 1882. Author of numerous reports and of a pamphlet on the battle of Five Forks. Member of National Academy of Sciences, American Association for Advancement of Science, and other scientific associations. Revised by JAMES MERCUR.

Warren, HENRY WHITE, D. D., LL. D.: bishop; b. in Williamsburg, Mass., Jan. 4, 1831; graduated at Wesleyan University, Middletown, Conn., in 1853; was for two years Professor of Ancient Languages at Wilbraham Academy, Massachusetts; joined the New England Conference of the Methodist Episcopal Church in 1858, and was pastor of various churches in New England; pastor of Arch Street church in Philadelphia 1871–74. From there he was sent to St. John's church, Brooklyn, N. Y., but in 1877 again became pastor of Arch Street church; was afterward appointed to Spring Garden church in the same city; is author of *Sights and Insights* (1874); *Studies of the Stars* (1878); *Recreations in Astronomy* (1878); *The One Book: Lectures on the English Bible* (1892); *The Bible in the World's Education* (1893). He was elected bishop May 12, 1880.
Revised by ALBERT OSBORN.

Warren, JOHN COLLINS, M. D.: surgeon; son of Dr. John Warren (1753–1815); b. in Boston, Mass., Aug. 1, 1778; graduated at Harvard 1797; studied medicine with his father, also at Edinburgh and in the hospitals of London and Paris; began practice in Boston 1802; was Assistant Professor of Anatomy and Surgery in the Harvard medical school 1806–15, and professor (as successor to his father) 1815–47, and emeritus professor 1847–56; was one of the founders of the Massachusetts General Hospital 1820, and of the McLean Asylum for the Insane; founder and editor of the Boston *Medical and Surgical Journal* (1828); president of the Massachusetts Medical Society 1832–36; president for many years of the Massachusetts Temperance Society and of the Boston Society of Natural History; carried into effect (1846) the successful application of ether in a surgical operation at the Massachusetts General Hospital; was a member of scientific societies in the U. S. and Europe, and made collections of comparative anatomy, osteology, and paleontology. D. in Boston, May 4, 1856. By his will he ordered his body to be given for examination to the medical school, and that his skeleton should be deposited in its museum. He was one of the editors of the *Monthly Anthology and Boston Review* (1804) and of the *Gospel Advocate* (1821–22); published numerous and valuable professional monographs, a *Genealogy of Warren, with some Historical Sketches* (1854); and several addresses before scientific bodies. See the *Life, chiefly compiled from his Autobiography and Journals* (Boston, 2 vols., 1860), by his brother, Edward Warren, M. D. Revised by S. T. ARMSTRONG.

Warren, JOSEPH: patriot; b. at Roxbury, Mass., June 11, 1741; graduated at Harvard 1759; studied medicine under Dr. Lloyd; began practice at Boston 1762; delivered in 1772, and again in 1775, the civic oration on the anniversary of the "Boston Massacre"; was a member of the provincial committee of correspondence in 1772; chairman of the committee of public safety 1774, and in 1775 president of the provincial congress, being thus the virtual executive of a *de facto* government at the outbreak of hostilities with Great Britain; was efficient in organizing the volunteers after the battle of Lexington; was chosen major-general by the provincial congress June 14, and took an active part as a volunteer, declining the command at the battle of Bunker Hill, at which he was killed June 17, 1775, falling near the spot where the Bunker Hill Monument now stands. A statue by Dexter was erected on Bunker Hill June 17, 1857. A *Life* by A. H. Everett may be found in Sparks's *American Biography*, and another by Richard Frothingham was published at Boston in 1865.

Warren, MERCY (*Otis*): poet and historian; sister of James Otis, orator; b. at Barnstable, Mass., Sept. 25, 1728; married James Warren about 1754; became a zealous patriot; corresponded with Samuel and John Adams, Thomas Jefferson, and other leaders of the Revolution; wrote several dramatic and satirical poems against the royalists (1773–75), which, with two tragedies, were included in a volume of *Poems, Dramatic and Miscellaneous* (1790), and published *A History of the Rise, Progress, and Termination of the American Revolution, interspersed with Biographical, Political, and Moral Observations* (Boston, 3 vols., 1805). D. at Plymouth, Oct. 19, 1814. The *Correspondence of John Adams and Mercy Warren* was published by the Massachusetts Historical Society in 1878. Revised by H. A. BEERS.

Warren, MINTON, Ph. D.: educator and author; b. in Providence, R. I., Jan. 29, 1850; educated at Tufts College (1866–70), Yale College, graduate department (1871–72), Leipzig, Bonn, and Strassburg Universities (1876–79); Ph. D., Strassburg, 1879; associate at Johns Hopkins University 1879–82; Associate Professor of Latin in the same institution 1883–92; and Professor of Latin 1892–99; became Professor of Latin in Harvard University in 1899; author of *The Enclitic ne in Early Latin* in *American Journal of Philology*, ii. (Baltimore, 1881); *Bentley's English MSS. of Terence*, same journal (1882); *Latin Glossaries with especial reference to the Codex Sangallensis 912*, edited with notes, in *Transactions of the American Philological Association*, vol. xv. (1885); *On the Contribution of Latin Inscriptions to the Study of the Latin Language and Literature*, in same (1895).

Warren, SAMUEL: lawyer and author; b. at Racre, Denbighshire, Wales, May 23, 1807; educated at the University of Edinburgh; began the study of medicine, but soon abandoned it for that of the law, which he pursued at the Inner Temple, London, 1828–30; contributed to *Blackwood's Magazine* the story *Btucher, or The Adventures of a Newfoundland Dog* (1824), when he was only seventeen years of age, and afterward his well-known *Passages from the Diary of a Late Physician* (1830–31); wrote several legal works: *On the Duties of the Attorneys and Solicitors*, *Select Extracts from Blackstone's Commentaries*, *Popular and Practical Introduction to Law Studies* (with J. W. Smith), etc.; became queen's counsel 1851; was recorder of Hull 1854–74; sat in Parliament as a Conservative 1856–59, and was appointed master in lunacy Feb., 1859; published *Ten Thousand a Year* (1839), a successful novel, and *Now and Then* (1847), an unsuccessful one; collected from the pages of *Btackwood* 2 vols. of *Miscellanies, Critical and Imaginative* (1854), and was author of various other literary productions, including the pamphlet *The Queen and the Pope* (1850) a violent attack on the pretensions of the Roman Church. D. in London, July 29, 1877. Revised by H. A. BEERS.

Warren, SAMUEL PROWSE: organist; b. at Montreal, Canada, Feb. 18, 1841; educated in Montreal till 1861, then in Germany till 1864. Returning to America he settled in New York, and in 1868 was appointed organist of Grace church, which position he resigned in 1894. He has played at many organ recitals and concerts. His compositions include much church music, organ arrangements, some songs both for solo and concerted voices, mixed and male partsongs, etc. D. E. HERVEY.

Warren, WILLIAM: actor; b. in Philadelphia, Pa., Nov. 17, 1812; made his first appearance on the stage at the Arch Street theater as Young Norval Oct. 27, 1832; played an engagement at the Park theater in New York in 1841; in 1845 appeared in London at the Strand theater; in Oct., 1846, appeared as Sir Lucius O'Trigger in *The Rivals* on the opening night of the Howard Athenæum, Boston, where he won an immediate success. In Aug., 1847, he became a member of the Boston Museum company, appearing Aug. 23 as Billy Lackaday. From that time until he retired, in 1882, with the exception of a brief interval when he made a tour of the principal cities of the U. S., he performed continuously at the Museum with unvarying popularity and success, representing probably in that time a greater variety of characters, and appearing a greater number of times, than any other living actor. In the old English comedies he was unrivaled, while the hits he made in special character parts were numerous. D. in Boston, Mass., Sept. 21, 1888.
Revised by B. B. VALLENTINE.

Warren, WILLIAM FAIRFIELD, S. T. D., LL. D.: minister and educator; b. at Williamsburg, Mass., Mar. 13, 1833; graduated at Wesleyan University, Middletown, Conn., 1853; became a preacher in the New England Methodist Conference 1855; subsequently studied theology at Andover, Berlin, and Halle; traveled in the East; was Professor of Systematic Theology in the Methodist Mission Institute at Bremen, Germany, 1861–66; acting president of the Boston Theological Seminary from 1866 until chosen president of Boston University 1873. He is the author of treatises on logic (1864) and on systematic theology (1865), both in German. Other works are *True Key to Ancient Cosmology*

and Mythological Geography (1882); *Paradise Found: the Cradle of the Human Race at the North Pole. A Study of the Prehistoric World* (1885; trans. into French by Count Soporta); *In the Footsteps of Arminius* (1888); *The Story of Gottlieb*, a study of ideals (1891; trans. into Arabic and German); *Constitutional Law Questions in the Methodist Episcopal Church* (1894). *The Quest of the Perfect Religion* (1887) was translated into many languages, and prepared the way in some degree for the Parliament of Religions held in Chicago in 1893.

Warrensburg: city; capital of Johnson co., Mo.; on the Black river, and the Missouri Pac. Railway; 29 miles W. of Sedalia, 64 miles E. S. E. of Kansas City (for location, see map of Missouri, ref. 4–E). It is in an agricultural region, has large sandstone quarries, and is a noted health and pleasure resort with several valuable springs. The city contains the South Missouri State Normal School, 3 public-school buildings, and 4 State banks with combined capital of $127,000, and has electric lights, water-works, flour and woolen mills, grain elevator, carriage and wagon factories, foundry and machine-shop, and 2 daily and 4 weekly newspapers. Pop. (1880) 4,049; (1890) 4,706; (1900) 4,724.

EDITOR OF "STAR."

Warrenton: town; capital of Fauquier co., Va.; on the Southern Railway; 50 miles W. by S. of Washington, D. C. (for location, see map of Virginia, ref. 4–G). It is in an agricultural region in the foothills of the Blue Ridge Mountains; for many years has been a popular summer resort; and has 7 churches, 3 public and 3 private schools, gravity water-works, private bank, building and loan association, and 2 weekly papers. Pop. (1880) 1,464; (1890) 1,346; (1900) 1,627. JOSEPH A. JEFFRIES, FOR EDITOR OF "TRUE INDEX."

Warrington: town; in Lancashire, England; on the Mersey; 18 miles E. of Liverpool (see map of England, ref. 7–F). The parish church is a Decorated building with a spire 300 feet high. There are manufactures of fustians, twills, corduroy, and other cotton goods, glass, leather, soap, and many kinds of tools. Pop. of the parliamentary borough, returning one member (1901), 64,241.

Warsaw (Polish, *Warszawa*; Germ. *Warschau*; Fr. *Varsovie*): the capital of the Russian general government of the Vistula provinces, and formerly the fortified capital of the kingdom of Poland; on the left bank of the Vistula, below its junction with the Pilica and Weprz (see map of Russia, ref. 8–A). It stands on a hill which gradually descends into a flat plain, and consists of the old town, the new town, and suburbs, of which the most important is Praga, on the right bank of the river, and connected with the city proper by two iron bridges—one of them 500 meters long, built in 1859–64, the other completed in 1876. The city is surrounded with walls and ditches, having at its lower end the Alexander citadel, built 1832–35, with a monument of Alexander I. Since the insurrection of 1830 the suburb Praga has been strongly fortified, and the head of the bridge protected by the fort Sliwitzki, so as to control the city proper; in 1883 a circle of fortifications was begun, eleven on the left, four on the right bank of the Vistula. Warsaw is the seat of the governor-general of the Tsarstvo of Poland with royal military powers, of a civil governor, and of a Roman Catholic and a Greek Catholic archbishop. The location of Warsaw is of great commercial importance. The navigable Vistula, the highroads running in all directions, the railway lines to Moscow, to St. Petersburg (built 1862), to Vienna (1848), to Dantzic, to Berlin by way of Lodz (which connects it with the rich coal-fields of Kielce), the Warsaw-Terespol (1867), and the Vistula Railway (Kowel-Mlawa, 1877), combine to make the city a commercial center, and the entrepôt of the European-Asiatic traffic. The city is traversed by street-railways, connecting the stations of the various railways. Manufacturing industries flourish. Linen and woolen cloths, carpets, boots, leather goods, saddlery, cotton and silk fabrics, pianos, carriages, furniture, goldware and silverware, machinery, chemicals, sugar, and tobacco are manufactured, and extensive distilleries and breweries are in operation. The transaction of business is facilitated by many banks that are under strict state supervision. There is much export trade in grain, flax, cattle, and horses, and in coal, while the finer manufactured goods are imported. Weekly markets and annual fairs attract thousands of Russian and foreign tradesmen. In architectural respects Warsaw has been greatly improved; formerly wretched and dirty huts alternated with magnificent palaces. Some portions of the city, like the Cracow suburb, with the statue of Copernicus by Thorwaldsen, and the New World, with their splendid buildings and streets, are very beautiful, and are not surpassed by those of any other European city. Warsaw has twelve public squares, full of historical monuments; among them are the Saxon Square, the Krasinski Square, and the Sigismund Square, with the column of Sigismund III., erected in 1643. Cracow Street is adorned with the equestrian statue of King Poniatowski by Thorwaldsen. Among the public buildings that show the fondness of the old nobility for display is the royal palace, built by Sigismund II., embellished by Augustus II. and Stanislas Augustus, with its famous senate-hall, deputy-hall with historical pictures and sculptures, unique library, and the Polish archives. A beautiful park adjoins St. John's Cathedral, built in 1360, which contains fine pictures and many tombs of celebrated Poles, and which is the most remarkable of the 179 Catholic churches. The Saxon, the Brühl, and many other palaces are royal in their magnificence. The Belvedere, the residence of Grand Duke Constantine till the outbreak of the great insurrection, the city-hall, the mint, and the theaters are beautiful edifices. The Greek Catholic Cathedral, completed in 1842, is in the modern style; the Lutheran church is one of the finest buildings in the city. Among the scientific institutions, which are numerous and excellent, is the university, founded in 1817, suppressed in 1832, and re-established in 1869 in the Kasimirowski Palace; it has about 1,000 students, and its avowed purpose is to Russianize the Poles. The university library contains more than 350,000 volumes, and is rich in works of Polish literature and history and law, though its contents were confiscated in 1794, and transferred to St. Petersburg, and it was again ransacked in 1831 for the same purpose. Other valuable possessions of the university are the numismatic cabinet, the museum of antiquities, the ethnographical museum, the zoölogical and mineralogical collections, the botanical garden, and the observatory. Besides a public art gallery there are private art collections belonging to the Ossolinski, Potocki, Dombrowski, and other families.

There is documentary evidence of Warsaw's existence in 1224, and in 1339 it was surrounded with walls and strongly fortified. It was the residence of the Dukes of Masovia till their extinction in 1526. Sigismund Augustus made it the residence of the Polish kings instead of Cracow. At Wola, a village near Warsaw, the elections of the kings formerly took place. The Swedes under Charles IX. Gustavus conquered the city in 1655, lost it again next year, but reconquered it after the murderous three days' battle at Warsaw (July 28–30, 1656). By the third partition it fell to Prussia, and by the Vienna Congress in 1815 it became definitely Russian. After the insurrection of 1830 it was stormed and crushed by Paskevitch, and again in 1863 a revolution was suppressed and the Siberian prisons and mines filled with Polish patriots. Still the vitality of the city and the nation was such as to recover and to increase even in spite of the most unfavorable political conditions. Warsaw is the center of the Polish nation, full of national spirit, learning, and culture. Pop. (1897) 614,752, more than 50 per cent. Roman Catholics, 33 per cent. Jews.

HERMANN SCHOENFELD.

Warsaw: city; Hancock co., Ill.; on the Mississippi river, and the Tol., Peoria and West. Railway; 3 miles below Keokuk, 40 miles above Quincy (for location, see map of Illinois, ref. 5–B). It is an important shipping-point for hay and general produce; is largely engaged in cooperage; and has flour and woolen mills, manufactories of agricultural implements and stove-polish, large pickle-works, public park, Masonic and Odd Fellows halls, 4 public-school buildings, Roman Catholic and Lutheran schools, public library, a private bank, and 2 weekly newspapers. It is the site of Forts Edward and Johnson, erected early in the nineteenth century. Pop. (1880) 3,105; (1890) 2,721; (1900) 2,335.

EDITOR OF "BULLETIN."

Warsaw: city; capital of Kosciusko co., Ind.; on the Tippecanoe river, and the Cleve., Cin., Chi. and St. L. and the Penn. railways; 40 miles W. of Fort Wayne, 109 miles E. of Chicago (for location, see map of Indiana, ref. 2–E). It is in an agricultural and lumbering region, and has 9 churches, 3 public-school buildings, court-house (cost $250,000), 2 State banks (combined capital, $160,000), a daily and 2 weekly papers, Spring Fountain Park, large canning and pickling works, flour and saw mills, and manufactories of flour-mill machinery and furniture. Pop. (1880) 3,123; (1890) 3,574; (1900) 3,987.

EDITOR OF "TIMES."

Warsaw: village (founded in 1803); capital of Wyoming co., N. Y.; on the Buffalo, Roch. and Pitts. and the Erie railways; 44 miles S. W. of Rochester, 48 miles E. of Buffalo (for location, see map of New York, ref. 5–D). It is in an agricultural region, with extensive deposits of salt in its vicinity, and has a national bank with capital of $100,000, a private bank, public union school with library, sanitarium, and salt baths, iron-foundry, map-roller factory, wagon and broom factories, numerous salt-works, and two weekly newspapers. Pop. (1880) 1,910; (1890) 3,120; (1900) 3,048.

EDITOR OF "WESTERN NEW YORKER."

Wars of Succession: See SUCCESSION WARS.

Warta: the largest tributary of the Oder; rises about 33 miles from Cracow, passes through Poland and the Prussian provinces of Posen and Brandenburg, where it joins the Oder at Cüstrin after a course of 445 miles, of which 265 are navigable. Through its chief affluent, the Netze, the Bromberg Canal, and the Brahe river, the Warta is connected with the Vistula, and forms the principal waterway of the province of Posen. H. S.

Wartburg, *vaart'boorch*: a castle near Eisenach, in Saxe-Weimar; founded in 1067 by Ludwig the Leaper, Landgrave of Thuringia, and for several centuries the residence of his successors. After passing through many vicissitudes it was restored with great magnificence and exquisite taste by Charles Alexander, Grand-Duke of Saxe-Weimar. It exercises, however, a much greater attraction by its historical remembrances than by its architectural merits. Here the famous contest between the minnesingers took place in the time of Landgrave Hermann I., about 1206 (see Lucas, 1838; Plötz, 1851), an event which forms the subject of the singular epic *Der Krieg von Wartburg*, probably written about 1260, edited by Ettmüller in 1830, and translated into modern German by Simrock in 1858. It was the residence of Elizabeth of Hungary (1207–31), the wife of Landgrave Louis II., and afterward one of the most renowned saints of the Roman Catholic Church; and Luther was kept concealed in the castle from May 4, 1521, to Mar. 3, 1522, while finishing his translation of the Bible. It is also famous for the festival held there by the Burschenschaft on Oct. 18, 1817, to celebrate the third centenary year of the Reformation and the recent liberation of the country from the French yoke. In the excitement of the moment the enthusiasm for liberty and fatherland ran a little high. Some books which were considered illiberal and unpatriotic were burned, and some plans were proposed for the reformation and elevation of the students' life at the universities, more especially for the abolition of the old traditionary barriers which separated the students of various German countries from each other. The whole affair was harmless, in spite of some exaggerations, but the German princes, alarmed by this attempt to revolutionize and republicanize Germany, and influenced by the reactionary warnings of Metternich, made it the occasion of severe measures against the liberals. See Keil, *Die burschenschaftlichen Wartburgfeste von 1817 und 1867* (Jena, 1868). F. M. C.

Wartenburg, York von: See YORK VON WARTENBURG.

Wart-hog: any wild hog of the genus *Phacochœrus*, family *Phacochœridæ*. The popular name was given on account of the large, fleshy projections on the sides of the face. The body is stoutly built, legs small, head disproportionately large, with a small but prominent eye set far up and back on the head. The snout is large, upper canines or tusks curved upward and outward, and sometimes of enormous size. Two species are known, *Phacochœrus africanus* or *æliana*, quite widely distributed over the northern parts of Africa, and *P. æthiopicus*, confined to South-east Africa. F. A. LUCAS.

Warton, JOSEPH: poet and critic; b. at Dunsford, Surrey, England, in 1722; brother of Thomas Warton, poet, and son of Thomas Warton (d. 1746), vicar of Basingstoke, Hampshire, and of Cobham, Surrey, and Professor of Poetry at Oxford 1718–28; educated at Winchester School; studied at Oriel College, Oxford; graduated 1744; took orders in the Church of England; was curate to his father at Basingstoke 1744–46; curate at Chelsea 1746–48; became rector of Winslade, Hampshire, 1748; traveled on the Continent with his patron, the Duke of Bolton, 1751; obtained the rectory of Tunworth 1754, that of Wickham 1782, and of Upham 1788; was second master of Winchester School 1755–66, and head master 1766–93; became chaplain to Sir George (afterward Lord) Lyttleton 1756, prebendary of St. Paul's, London, 1782, and of Winchester 1788. He published *Odes on Various Subjects* (1746); a poetical translation of the *Eclogues and Georgics of Vergil* (1753); an *Essay on the Genius and Writings of Pope* (2 vols., 1756–82); contributed twenty-four critical papers to *The Adventurer* (1753–56), and edited the works of Pope (9 vols., 1797) and Dryden, the latter completed after his death (4 vols., 1811). D. at Wickham, in Hampshire, Feb. 23, 1800. A volume of *Biographical Memoirs* (1806) was published by Rev. John Wooll. The Warton brothers were scholars of antiquarian tastes, leaders in the English romantic movement, elegant critics, and imitative poets. Revised by H. A. BEERS.

Warton, THOMAS: poet; brother of JOSEPH WARTON (*q. v.*); b. at Basingstoke, Hampshire, England, in 1728; studied at Trinity College, Oxford; graduated about 1747; became a fellow there 1751; took orders in the Church of England 1755; was Professor of Poetry in the university 1757–67; became Camden Professor of Ancient History and poet-laureate 1785; and obtained the livings of Kiddington 1771 and Hill Farrance 1782. D. at Oxford, May 21, 1790, having resided for forty years in Trinity College. He was the author of *Observations on the Faerie Queene of Spenser* (1754); *The Life of Sir Thomas Pope* (1772); and of a valuable *History of English Poetry* (3 vols., 1774–81), intended to extend to the beginning of the eighteenth century, but never continued beyond the Elizabethan age. Revised editions were issued in 1824, 1840, and 1870. Warton edited the Greek *Anthology* (1766), the works of Theocritus (Oxford, 2 vols., 1770), and the *Minor Poems of Milton* (1785; 2d ed. 1791), and published several occasional poems, of which a collection appeared in 1777. His *Poetical Works* (1802) were edited, with a sketch of his life, by Richard Mant, D. D., Bishop of Down. They have also been included in Chalmers's *British Poets* (1810).

Revised by H. A. BEERS.

Warts, or **Verrucæ** [*wart* < M. Eng. *werte* < O. Eng. *wearte*: O. H. Germ. *warza* (> Mod. Germ. *warze*): Icel. *varta*; *verrucæ* is plur. of Lat. *verruca*, wart]: small circumscribed excrescences or elevations on the skin, developed by hypertrophy or abnormal growth of the papillæ of the skin. They may be round and ovoid or conical, thread-like, or broad and flat. The so-called "seeds" or points of a dry wart correspond to the number of papillæ which have become elongated and thickened. Each papilla of the skin has an independent supply of blood by a little loop of capillary blood-vessels at its base. Hence mere removal of the wart is followed by its renewal from the well-nourished base and remaining cells which have transmitted the tendency to excessive growth. Cases are often cited of warts communicated by the blood from other warts, but the best authorities deny them. Warts occur chiefly in children between the second and fourteenth year; their cause is uncertain. Their duration is indefinite; they sometimes disappear suddenly, probably by contraction of the vascular papillary base and casting off of the superabundant dry cells. When they are kept free from handling or irritation, the diet is corrected, and alteratives are given, they may slowly disappear. The common treatment is to snip them off and touch the base with nitric acid, glacial acetic acid, or lunar caustic.

Warville, BRISSOT, de: See BRISSOT DE WARVILLE.

Warwick, wor'ik, or **Warwickshire**: county in the center of England; bounded on the W. by Worcestershire, on the N. by Staffordshire and Leicestershire, and on the S. by Oxfordshire, watered by the Avon and the Tame in the N. Area, 885 sq. miles. The surface is elevated; in the northern part, which once was covered with the Forest of Arden, moor, heath, and forest alternate, and the soil is often heavy and cold; in the southern part the soil is very fertile. Agriculture and dairy-farming are in an advanced state. Coal, chalk, lime, and marl are found. The manufactures are extensive. Pop. (1891) 805,070.

Warwick: county-town of Warwickshire, England; on the Avon; 21 miles S. E. of Birmingham (see map of England, ref. 10–H). It contains several fine buildings, among which the most remarkable is the castle. The oldest, and also the highest, of the castle's towers (147 feet), is of uncertain date; the next highest (128 feet) dates from the latter part of the fourteenth century. Besides having great architectural interest, the castle contains large collections of paintings, arms, and other objects of artistic and archæological value. By the fire of Dec. 3, 1871, the building and collections

(which are open to the public) suffered considerably; but by 1876 the damage had been repaired. There are some manufactures of art furniture and a trade in agricultural produce. Pop. of the parliamentary borough, returning one member (1891) 39,102.

Warwick: village; Orange co., N. Y.; on the Wawayanda creek, and the Lehigh and Hudson River Railway; 11 miles S. of Goshen, 29 miles S. W. of Newburg (for location, see map of New York, ref. 7–J). It is in an agricultural region, with granite quarries and iron mines 4 to 6 miles distant, and is near Greenwood, Wawayanda, Clark's, and Glenmere lakes. It has 6 churches, Warwick Institute, 5 hotels, 3 creameries, fabric-hose works, foundry, railway-shops, a national bank (capital $100,000), a savings-bank, and 2 weekly newspapers. Warwick is 550 feet above tide-water, and is a health and summer resort. Pop. (1880) 1,043; (1890) 1,537; (1900) 1,735. EDITOR OF "ADVERTISER."

Warwick: town of Kent co., R. I.; settled in 1642 by twelve Englishmen, of whom SAMUEL GORTON (*q. v.*) was the leading spirit, and incorporated 1647. It is 5 miles S. of Providence, on the Providence and Pawtuxet rivers, and is crossed in one direction by the Stonington Railway (now the N. Y., N. H. and Hart.), and by the N. E. in another (see map of Rhode Island, ref. 8–N). It has no compactly settled quarter, and consists of about twenty-seven villages, many of which are connected by electric railway. The Pawtuxet furnishes power for many manufacturing establishments, chiefly cotton (some woolen) and printed goods. The town has a national bank (capital $100,000) and a savings-bank, and there are churches and schools in every village. In some villages there are free public libraries under the patronage of the State. Pop. (1890) 17,761; (1900) 21,316.

Warwick, GUY, Earl of: a legendary Saxon hero who figures largely in early English metrical romances as a champion against the Danes, being especially noted for his victory over the giant Colbrand. The romance of Sir Guy is mentioned in Chaucer's *Canterbury Tales* and alluded to in Shakspeare's *King John* and *Henry VIII.* He is usually assigned to the period of King Athelstan. In his *Specimens of Early English Metrical Romances*, Ellis suggests that the legendary Guy is identical with Egil, an Icelandic warrior in Athelstan's army, who contributed much to his victory over the Danes at Brunanburg; and Dugdale even goes so far as to fix the date of his combat with Colbrand in the year 926. But Guy of Warwick is unknown to English history, and equally so to English legend, until he emerges as the hero of Anglo-Norman poems of the twelfth century. Two English translations of these were made at the beginning of the fourteenth century, and a third about fifty years later. *The Booke of the most victoryous Prince Guy of Warwick*, a metrical romance of the earlier half of the fourteenth century, was printed before 1567, and a prose French romance on the same subject, printed in 1525, was edited by J. Zupitza for the Early English Text Society 1875–76. Revised by H. A. BEERS.

Warwick, HENRY DE BEAUCHAMP, Duke of, and King of the Isle of Wight: son of Richard; b. at Hanley Castle, Warwickshire, England, Mar. 22, 1424; succeeded to the earldom on the death of his father 1439; distinguished himself in the defense of Normandy 1442–44; was created Duke of Warwick, to rank next the Duke of Norfolk and before the Duke of Buckingham—a provision which led to a controversy with the latter nobleman, which was settled by act of Parliament to the effect that the claimants should take precedence in alternate years; and received from Henry VI., who had been his companion in childhood, many honors, the most extraordinary being that he was crowned by that monarch as vassal King of the Isle of Wight early in 1445, which, however, did not mean much more than an empty ceremony. He survived his advancement but a few months, dying without issue June 11, 1445.

Warwick, RICHARD DE BEAUCHAMP, Twelfth Earl of: b. at Salwarpe, Worcestershire, Jan. 28, 1381; son of Thomas, who was condemned as a traitor in the reign of Richard II., but not executed; was made a Knight of the Bath at the coronation of Henry IV. (1399); succeeded to the earldom 1401; fought against Owen Glendower 1401–02, and against the Percies 1403, taking part in the famous battle of Shrewsbury; made a pilgrimage to the Holy Sepulcher 1408; visited several European courts, where he distinguished himself at tournaments; was lord high steward at the coronation of Henry V. (1413), and in the same year commissioner to negotiate peace with France; headed an embassy to the Council of Constance 1414; was an energetic opponent of the Lollards or followers of Wycliffe; became in 1415 Captain of Calais, where he entertained the Emperor Sigismund with such grace as to receive from him authority to bear the title "father of courtesy"; aided in the siege and capture of Caen 1417; was ambassador to the Duke of Burgundy 1418; was created about that period Earl of Aumerle (otherwise Albemarle); attended Henry V. on his deathbed (1422); was regent of France 1425–28; directed for nine years the education of the young king, Henry VI., gaining the title "the good earl," and was again regent or lieutenant-general of France and Normandy from 1437 to his death at Rouen, Apr. 30, 1439. He was buried and has a magnificent tomb in the Church of St. Mary, Warwick. He was possessed of immense landed estates, was father of Anne, the wife of Richard Neville, subsequently Earl of Warwick, and was author of some courtly verses preserved in MSS. in the British Museum.

Warwick, RICHARD NEVILLE, Earl of, known as "the king-maker": soldier and statesman; b. in England between 1420 and 1430; was related to both the Lancastrian and the Yorkist houses, being first cousin to Edward IV. and second cousin to Henry VI.; became the most wealthy and powerful nobleman of the kingdom; fought along with his father in the War of the Roses, which grew out of the claims of the Duke of York to the throne; bore a leading part in the first battle, that of St. Albans, 1455, which he decided in favor of the Yorkists by a daring charge into the town; was rewarded with the important post of captain of Calais and was afterward reconciled with Henry VI., but having been accused of misconduct, attacking a fleet of Lubeck merchantmen, he retired to Calais in anger. On the renewal of the civil war in 1459 he joined the Yorkist forces, and on the failure of their attempt returned to Calais, whence after negotiating with the Duke of York he fitted out an expedition, landed in Kent (June, 1460), and entered London without a battle. He defeated the queen's army near Northampton in July, capturing the imbecile king, Henry VI., after which the Duke of York laid formal claim and was recognized as heir to the throne. At the disastrous battle of Wakefield, however, in December, the pretender was killed, and the Earl of Salisbury (Warwick's father) and twelve other Yorkist nobles were captured and beheaded at Pontefract. Warwick suffered another defeat at the second battle of St. Albans Feb., 1461, but, having raised another army and joined the young Duke of York, marched upon London, where the duke was proclaimed king Mar. 4 under the title of Edward IV. Warwick next defeated the Lancastrians at the desperate battle of Towton, near the city of York, Mar., 1461, and was active in suppressing the attempt of the Lancastrians to regain their power in 1463. He captured the deposed king, Henry VI., and lodged him in the Tower (1465). He was rewarded with vast estates and the most important offices in the kingdom. He had now a revenue from his offices alone of 80,000 crowns a year, and displayed a regal magnificence, keeping open house wherever he went and maintaining many thousands of servants or dependents. He was employed on missions to France, Burgundy, and Brittany, and took such deep offense at the king's marriage with Elizabeth Woodville (1464), while he was engaged in negotiating for him the hand of a French princess, that he began to be disaffected; gave his daughter in marriage to Edward's brother, George, Duke of Clarence, without the royal permission, 1468, and, taking advantage of an insurrection against certain taxes in Yorkshire, placed himself, with Clarence, at the head of the rebellion; defeated the royal forces at Edgecote 1469, capturing the king and putting to death the queen's father and brother; had a brief reconciliation with the king; was again in arms against him in the following year (1470); was forced to flee to France; made at Amboise a treaty with Queen Margaret for the restoration of Henry VI., the marriage of Prince Edward of Lancaster to his daughter Anna (August), and the recognition of his son-in-law Clarence as heir-presumptive to the latter. By this double marriage the crown seemed now assured to the descendants of Warwick, who, aided by Louis XI., landed with a body of exiles at Plymouth and Dartmouth Sept. 13, 1470, successfully marched upon London, restored Henry VI., and was reinstated in all his offices, with the addition of that of lord high admiral. The Lancastrian restoration, however, had lasted barely six months before Edward IV., who had escaped to Holland, obtained the aid of Charles the Bold,

Duke of Burgundy; landed at Ravenspur, near Hull, with 2,000 men, English, Dutch, and Flemings, and Warwick, along with his brother Montague (then Earl of Northumberland), betrayed by his son-in-law Clarence, was defeated and killed at the battle of Barnet, Apr. 14, 1471. They were buried at Bisham Abbey, Berkshire. F. M. COLBY.

Warwick, ROBERT RICH, Earl of: a descendant of Lord Chancellor Rich; b. in England about 1590; succeeded to the earldom 1618; became a prominent leader of the Puritan party; took an active part in promoting the colonization of New England, especially of Rhode Island; was an intimate friend and protector of Thomas Hooker, the celebrated founder of Connecticut, and of other Puritan clergymen, whom he protected during the ecclesiastical prosecutions of the reign of Charles I.; adhered to the cause of Parliament during the great rebellion; became lieutenant of the fleet under the Earl of Northumberland 1642, and was a prominent supporter of Cromwell as Protector, and was appointed to bear the sword of state in the latter's presence 1657. D. in 1658.

Wasatch or **Wahsatch Mountains**: See UTAH and ROCKY MOUNTAINS.

Wase'ca: city (founded in 1869): capital of Waseca co., Minn.; on the Chi. and N. W. and the Minn. and St. L. railways; 15 miles W. of Owatonna, 26 miles E. by S. of Mankato (for location, see map of Minnesota, ref. 11-E). It is in an agricultural and dairying region; is on Clear Lake, where are located the extensive grounds and buildings of the Minnesota Chautauqua; and has 11 churches, graded public school, Roman Catholic academy, a State bank with capital of $25,000, flour-mills, and 2 weekly newspapers. Pop. (1880) 1,708; (1890) 2,482; (1900) 3,103.

EDITOR OF "RADICAL."

Washburn: town (settled in 1829, incorporated in 1861); Aroostook co., Me.; on the Big Machias river; 52 miles N. by W. of Houlton, the county-seat (for location, see map of Maine, ref. 3-F). It contains the villages of Washburn and East Washburn, three churches, high school, and public library. Pop. (1880) 809; (1890) 1,097; (1900) 1,225.

Washburn: city (founded in 1883); capital of Bayfield co., Wis.; on Lake Superior, and the Chi., St. P., Minn. and Omaha Railway; 60 miles E. of Duluth, 198 miles N. E. of Minneapolis (for location, see map of Wisconsin, ref. 1-C). It has 11 churches, high school (building cost $40,000), 3 grammar schools, court-house (cost $50,000), a State bank with capital of $16,000, and 2 weekly newspapers, and is principally engaged in lumbering, brownstone-quarrying, and shipping coal, grain, and general merchandise. It is the site of the oldest settlement in Wisconsin, a Jesuit mission having been established here in 1665. Pop. (1890) 3,699; (1900) 6,814. EDITOR OF "ITEMIZER."

Washburn, CADWALLADER COLDEN, LL. D.: soldier; brother of Charles A. Washburn; b. at Livermore, Me., Apr. 22, 1818; studied law and settled at Mineral Point, Wis., in 1841, where he had a large practice as counsel for the early settlers in securing their homes. In 1854 he was elected to Congress, and by re-elections served till Mar. 3, 1861, declining another election. At the breaking out of the civil war he raised the Second Wisconsin Cavalry, of which he was made colonel, in Oct., 1861; was commissioned brigadier-general by President Lincoln in July, 1862, and was engaged in the Arkansas campaign during that year; was commissioned major-general of volunteers in Nov., 1862; was engaged in the siege of Vicksburg, and at its close was ordered to the department of the Gulf in command of the Thirteenth Corps; was ordered to Texas in Nov., 1863, with a portion of the Thirteenth Corps, and captured Fort Esperanza, a strong casemated fortification at Pass Cavallo, guarding the entrance to Matagorda Bay; in Apr., 1864, relieved Gen. Stephen A. Hurlbut in command at Memphis of the district of West Tennessee; resigned May 25, 1865. In 1867 he was again elected to Congress and re-elected in 1869; in Nov., 1871, was elected Governor of Wisconsin, but failed of re-election in 1873. He resided at Madison, Wis., and was largely engaged in the manufacture of lumber at La Crosse, Wis., and of flour at Minneapolis, Minn. The Washburn Observatory of the University of Wisconsin was founded by him. D. at Eureka Springs, Ark., May 14, 1882.

Revised by JAMES MERCUR.

Washburn, CHARLES AMES: editor and author; brother of C. C. Washburn; b. at Livermore, Me., Mar. 16, 1822. He graduated at Bowdoin College 1840, and soon after went to California, where he became editor and eventually proprietor of the *Alta California*, a journal published in San Francisco. This was the first Californian paper to advocate the principles of the Republican party, and the growth and the strength of the party on the Pacific slope were largely due to Mr. Washburn's influence. From 1858 to 1861 he was editor and proprietor of the *San Francisco Daily Times*, and in 1860 he was chosen presidential elector-at-large. In 1861 President Lincoln appointed him minister to Paraguay, and he resided in that country in 1861-65, and again in 1866-68. During the latter period the most exciting episodes of the Paraguayan war with Brazil, the Argentine Republic, and Uruguay were enacted, and Minister Washburn was almost the only intelligent observer of the interior condition of Paraguay while the struggle was going on. The tyranny of Lopez culminated in the imprisonment and death of nearly all the better class of Paraguayans and foreign residents, who were accused of complicity in an imaginary conspiracy. Mr. Washburn, after vainly protesting against these acts, was himself accused, and escaped with his family only by the timely arrival of the U. S. steamer Wasp. After his return to the U. S. he published *The History of Paraguay* (2 vols., 1871). Mr. Washburn also wrote *Philip Thaxter* (New York, 1861); *Gomery of Montgomery* (1865), and other novels. D. in New York, Jan. 26, 1889. HERBERT H. SMITH.

Washburn, EDWARD ABIEL, D.D.: clergyman; b. at Boston, Mass., Apr. 16, 1819; graduated at Harvard 1838; studied theology at Andover and New Haven; became a Congregational minister in 1842, but left the denomination to enter the Protestant Episcopal Church, and was ordained priest 1845; was rector of St. Paul's church, Newburyport, Mass., 1844-51; traveled in Asia, Egypt, and Europe 1851-53; was rector of St. John's, Hartford, Conn., 1853-62, and at the same time Professor of Church Polity in the Berkeley Divinity School, Middletown; was rector of St. Mark's, Philadelphia, 1862-65, when he succeeded Bishop Coxe as rector of Calvary church, New York, which charge he held till his death. Dr. Washburn was a member of the New Testament company of revisers, and a leader among the Broad Church clergy of the Episcopal Church. Besides numerous sermons and review articles, he published *Relation of the Episcopal Church to the other Christian Bodies* (1874); *The Social Law of God* (New York, 1874; 6th ed. 1884); *Epochs of Church History* (posthumously ed. by Dr. Tiffany, 1883); *Voices from a Busy Life* (poems, 1883). D. in New York, Feb. 2, 1881.

Washburn, EMORY, LL. D.: jurist; b. at Leicester, Mass., Feb. 14, 1800; entered Williams College at the age of thirteen; graduated in 1817; after a three years' course of study at the Harvard Law School was admitted to the bar, and at the age of twenty-one commenced practice at Charlemont, Mass.; afterward removed to his native town of Leicester, and in 1828 settled in Worcester. In 1825 and 1826 he represented Leicester in the Massachusetts General Court, and Worcester in 1838. In 1841 and 1842 was a member of the State Senate for Worcester County. He was also nominated for Congress at a time when his party, the Whigs, had several thousand majority, but declined the nomination; in 1844 was appointed a judge of the court of common pleas, which office he resigned in 1847. During his absence in Europe in 1852 he was nominated and elected Governor of Massachusetts, and was re-elected the ensuing year. He removed to Cambridge in 1856, having been appointed Professor of Law in the Harvard Law School, which position he held for twenty years, resigning Sept. 1, 1876; then took up the general practice of law; served in the State Legislature, and held other positions of public and private trust. His *Lectures on the Study and Practice of the Law*, his *Treatise on the American Law of Easements and Servitudes*, and the more elaborate work in three volumes, *Treatise on the American Law of Real Property*, are the highest standard authorities in both the law schools and the courts throughout the U. S. He also published a *Judicial History of Massachusetts*, a *History of Leicester*, and a *Manual of Criminal Law* (1878), besides pamphlets, essays, etc. D. at Cambridge, Mass., Mar. 17, 1877. Revised by F. STURGES ALLEN.

Washburn, GEORGE: See the Appendix.

Washburn, WILLIAM BARRETT, LL. D.: U. S. Senator; b. at Winchendon, Mass., Jan. 31, 1820; graduated at Yale College 1844; engaged in manufacturing at Greenfield, Mass., and made it his residence; was also engaged in banking, and in 1859 was chosen president of the Bank of Greenfield; was elected to the Massachusetts State Senate 1850, and a

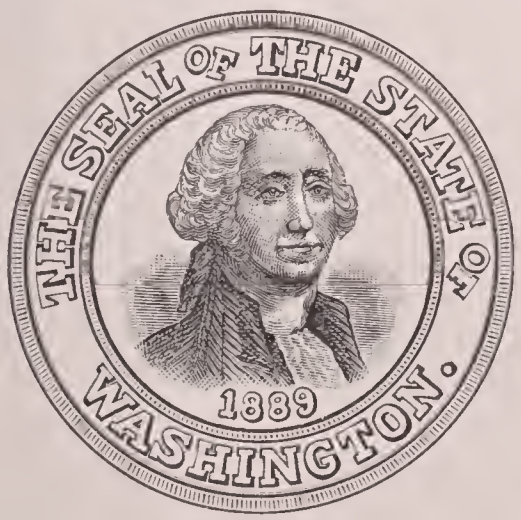
member of the House of Representatives 1854. He was nominated as the Republican candidate for Congress for his district in 1862, and had the unusual, if not unprecedented, honor of being elected by a unanimous vote; was re-elected biennially till 1872, when he resigned to be inaugurated Governor of Massachusetts; was twice re-elected Governor, and was U. S. Senator 1874–75 to fill the vacancy occasioned by the death of Charles Sumner. He was one of the trustees of Yale College and of the Massachusetts Agricultural College; also a trustee of Smith College, Northampton, Mass. D. at Springfield, Mass., Oct. 5, 1887.

Washburne, Elihu Benjamin: statesman; b. at Livermore, Me., Sept. 23, 1816; brother of Charles A. Washburn (added an "e" to the family name); early learned the printer's trade, and studied at the academy at Kent's Hill, Readfield, Me.; afterward studied law in Hallowell and Boston and at Harvard law school; in 1840 settled in Galena, Ill., where he began the practice of law with Charles S. Hempstead; in 1852 was elected to Congress, and continued to serve till Mar., 1869. At the time of his retirement he was by consecutive elections the oldest member, or, in congressional parlance, the "father of the House." On the accession of Gen. Grant to the presidency he was appointed Secretary of State, but soon resigned that office to accept that of minister plenipotentiary to France. He was serving in this capacity at the outbreak of the war between France and Prussia, and was the only foreign minister to remain at his post during the siege of Paris and the Commune, giving shelter and protection as far as possible to all foreigners. His firmness in protecting those unfortunate Germans who were unable to leave Paris won the admiration of all foreign governments. At the close of the war the German emperor conferred upon him the Order of the Red Eagle and sent him his portrait and autograph. On his return to the U. S. he settled in Chicago, Ill., and in 1880 his name was brought forward as a candidate for the presidency, but he declined to have it presented to the convention. He was the author of *Recollections of a Minister to France* (2 vols., New York, 1887). D. in Chicago, Oct. 22, 1887.

Washing of Feet: in supposed accordance with the Lord's example and mandate (John xiii. 5–14), a practice which was common in early Christianity, and continued so during the Middle Ages. At the present day it is observed by many of the minor Protestant sects in America, as Seventh-day Adventists, the Original Free-will Baptists, United Baptists, Baptist Church of Christ, Primitive Baptists, Old Two-seed-in-the-Spirit Predestinarian Baptists, River Brethren, United Zion's Children, the Church of God, the Dunkards, and Mennonites. It is observed in Europe by the Mennonites and other similarly primitive organizations. It was a practice of the early United Brethren in Christ. In the Roman Catholic Church the pope himself and the bishops and priests of certain dioceses wash the feet of twelve pilgrims once a year on Maundy Thursday, after the celebration of a solemn mass. It is a court ceremony, participated in by the emperor in the burg at Vienna and in the Kremlin at Moscow. It was formerly observed among the Jesuits.

Samuel Macauley Jackson.

Washington: one of the U. S. of North America (Western group); the twenty-ninth in order of admission into the Union; popularly known as the Evergreen State; capital, Olympia.



Seal of Washington.

Location and Area.—It lies between lat. 45° 32′ and 49° N. and lon. 117° and 124° 48′ W., and is bounded on the N. and N. W. by British Columbia, on the E. by Idaho, on the S. by Oregon, and on the W. by the Pacific Ocean. The southern boundary line for about three-fourths of its length follows the lower course of the Columbia river, the eastern part of it following the parallel of 46°; and the southern part (about 30 miles) of the boundary between Washington and Idaho is formed by the Snake river. The extreme width of the State from N. to S. is about 240 miles; extreme length E. to W., 360 miles; area, according to the census of 1900, 69,180 sq. miles, of which 2,300 are water.

Physical Features.—The Cascade Mountain range, extending through the State from N. to S., divides it into two parts known as Eastern Washington and Western Washington. Eastern Washington includes an area sometimes called Central Washington, lying between the Columbia river and the Cascade Mountains, and including the Yakima and Kittitas valleys, which were formerly considered sterile sage-brush plains, but are now being rapidly transformed into most fertile valleys by irrigation. Water for this purpose is taken largely from the Yakima river, a tributary of the Columbia. These two rivers, with the Snake, Spokane, Methow, and Okanogan rivers, include the most important watercourses of Eastern Washington. They afford untold possibilities of water-power, as there are many falls and rapids. The falls at Spokane are estimated at 35,000 horse-power, and are used by manufacturers. The largest lake in the Northwest is Lake Chelan, in Okanogan co., Eastern Washington, 70 miles long and about 3 miles wide. Besides the two valleys mentioned there are the fertile valley of Walla Walla, the Palouse valley (a large area of rolling land, especially adapted to cereals), the Colville valley (in Stevens County), the Okanogan valley (now used for grazing), and the large plateau known as the Big Bend Country, because it lies in the loop or large bend of the Columbia river. There are several smaller areas, such as the fertile Klickitat valley, and small fruit plats along the river courses. Western Washington is entirely different in its general features. Its area is a little over one-half as great, and its slope to tidewater is abrupt when compared with the long stretch of rolling plains and valleys of Eastern Washington. The most important part of Western Washington is known as the Puget Sound Basin. Its great body of water, now known generally as Puget Sound, embraces, with its bays and inlets, an area of about 2,000 sq. miles, including what is acknowledged to be one of the finest series of harbors on the globe. The rest of the coast is abrupt and barren of harbors, excepting Gray's and Willapa harbors. The important rivers of the Puget Sound Basin are the Skagit, Snohomish, Puyallup, Nisqually, White, and Dwamish—all of which drain productive and fertile valleys bearing the names of the rivers. Other important rivers of Western Washington are the Chehalis, flowing into Gray's harbor; the Willapa, flowing into Willapa harbor; and the Cowlitz, flowing southward into the Columbia river. A branch of the Snohomish forms the picturesque Snoqualmie Falls, about 20 miles E. of Seattle. The most important lake in Western Washington is Lake Washington, about 15 miles long and 3 miles wide. Lake Union lies between this lake and Puget Sound, and Seattle extends to the shores of both lakes. Lake Whatcom lies back of New Whatcom, in Whatcom County. Along the west coast of the State is a range of irregular mountains called the Olympics, or Coast Range, which embraces a stretch of practically unexplored lands between Puget Sound and the Pacific Ocean. One important feature of Western Washington is the islands of Puget Sound. Two whole counties—Island and San Juan—are composed entirely of islands. They are important for agricultural purposes, and supply the bulk of the lime used in the State. The possession of most of these islands was a matter of dispute with Great Britain for many years, and was not adjusted until 1873. The names of the most important islands are Whidby, San Juan, Orcas, Lopez, Camano, Fidalgo, Guemes, Lummi, and Waldron. The following table shows the altitudes of important points in the State:

Locality.	Elevation, feet.	Locality.	Elevation, feet.
Mt. Rainier	14,444	Colfax	1,941
Mt. Baker	10,827	Colville	1,917
Mt. St. Helens	9,750	Spokane	1,910
Mt. Adams	9,570	Ellensburg	1,518
Natchess Pass	4,900	Dayton	1,360
Stampede Pass (summit)	3,980	Fort Spokane	1,300
Snoqualmie Pass	3,110	Sprague	1,200
Great Plain of Columbia river	1,000 to 3,000	Walla Walla	1,000
N. P. R. R. Stampede tunnel	2,885	North Yakima	990
Kechelas Lake	2,388	Palouse Junction	858
Kachess Lake	2,158	Pasco	340

Fauna.—The native animals found in Washington include the elk, deer, caribou, mountain goat, mountain sheep (big-

horn), bear, cougar, wildcat, wolf, coyote, raccoon, otter, beaver, wolverine, martin, skunk, muskrat, sewellel, fisher, and small rabbits and squirrels. There are no poisonous reptiles or insects, except the rattlesnakes that are found in a few places in Eastern Washington. The birds of the State are innumerable. The principal game birds are ducks of various kinds, geese, swans, prairie chickens, grouse, pheasants, quails, and pigeons. Fossil remains of many extinct animals and fishes are found, notably the *Elephas primigenius*. The streams and lakes, and the various bodies of salt water, abound in many varieties of fish and shellfish. The principal fishes of commerce are the salmon and halibut. Native oysters, though of very small variety, are largely exported to Pacific coast markets.

Soil and Productions.—The two natural divisions of the State are not more different in climate and topography than in the general characteristics of the soil and productions. The prevailing soil in Eastern Washington is a volcanic ash. It is light, and, when properly watered, is wonderfully productive. In Western Washington the soil mostly cultivated is that of the river bottoms and reclaimed tide-marshes, where it is a rich alluvial loam. The first settlers found in Eastern Washington the bunch-grass plains, unexcelled anywhere for natural grazing-ground, and in Western Washington the unparalleled forests of cone-bearing trees. The reclaimed tide-marshes of the Puget Sound Basin have proved wonderfully productive. In a report on the tide-marsh lands in the U. S. in 1885, the U. S. Agricultural Department made the following statement: "Reclamation has nowhere been so popular and uniformly successful as with the pioneers on Puget Sound." And, further: "Perhaps no other farm-lands in the country have for a series of years yielded so large returns on the invested capital as the diked lands of Puget Sound." The State, especially the western portion, was very heavily clothed with native vegetation. The forests are famous for the size and number of trees. A large percentage of these belong to the family of conifers, and the deciduous or hardwood varieties are few and of little value. About nine-tenths of the Puget Sound forests consist of the fir timber of commerce (*Pseudotsuga taxifolia*). The other trees are cedar, spruce, hemlock, larch, pine, maple, alder, cottonwood, dogwood, madrona, bearberry, crabapple, yew, and a few scattering oaks. Smaller vegetation grows in luxuriant tangles in the low lands of Western Washington, and in some places is practically impenetrable. The soil in such localities, when cleared, is the richest. In Eastern Washington there are some forests of pine, fir, and cedar, greatly prized by the settlers of that part of the State, but the timber is much inferior to that of the Puget Sound forests. The drier plains of Eastern Washington were originally covered with sage-brush and bunch-grass.

The principal agricultural crops of Eastern Washington are wheat, barley, hay, hops, and oats; and of Western Washington, oats, potatoes, hops, and hay. There are also grown vegetables of all kinds, flax, rye, Indian corn, and in a few places in Central Washington some peanuts are raised. Hops thrive well; in 1890 42,476 bales were harvested, in 1900 33,254 bales. Yields are reported of from 600 to 3,000 lb. of hops to the acre. In fruits, the State excels in prunes, apples, pears, cherries, and the small berries. The acreage is increasing rapidly and the surplus product is shipped to markets in the Eastern States. Irrigation is revolutionizing agriculture in the central part of the State, where sage-brush plains are being transformed into productive farms. In 1890 there were reported 48,000 acres of irrigated land under cultivation. This has been largely increased and millions of dollars are being invested in irrigating-works. The principal crops produced in the sections reclaimed by means of irrigation are fruits, alfalfa, hops, and vegetables. The Yakima valley, in the center of the irrigated lands, exports, among other things, many carloads of watermelons.

The following summary, which is compiled from the census reports of 1880 and 1890, shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms	6,529	18,056	176·6
Total acreage of farms	1,409,421	4,179,190	196·5
Total value of farms, including buildings and fences	$13,844,224	$83,461,660	502·9

* Increase.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1900:

CROPS.	Acreage.	Yield.	Value.
Corn	5,307	106,140 bush.	$62,623
Wheat	1,067,000	25,096,661 "	12,799,297
Oats	87,681	3,016,226 "	1,206,490
Rye	2,403	39,169 "	22,718
Barley	41,505	1,386,267 "	540,644
Potatoes	15,859	1,839,644 "	864,633
Hay	391,894	846,491 tons	8,041,664
Totals	1,611,649	.....	$23,538,069

On Jan. 1, 1900, the farm animals comprised 171,391 horses, value $6,722,893; 1,470 mules, value $86,596; 122,414 milch cows, value $4,333,456; 268,030 oxen and other cattle, value $6,757,573; 790,217 sheep, value $2,470,218; and about 200,000 swine, value $1,100,000—total head, 1,553,522; total value, $20,370,736.

Minerals.—The value of the total mineral product in 1889 was $2,998,355. The greatest product of the mines thus far has been coal, but gold, silver, lead, iron, copper, zinc, antimony, nickel, bismuth, and other metals are found in paying quantities. Granite, sandstone, lime, marble, and valuable clays are also found. Many of the mining districts abounding in precious metals are as yet only prospected and are awaiting railways to mature development. Two large smelters are in operation, one in Tacoma, the other in Everett. Only bituminous coal is now mined. There are 23 mines in operation, located in King, Kittitas, Pierce, Cowlitz, Lewis, Skagit, and Whatcom Counties. King County produced in 1899 847,303 short tons; Kittitas 661,210; Pierce, 506,385; Skagit and Whatcom 14,203; Cowlitz and Lewis, 780. The total production was 2,029,881 short tons, valued at $3,603,989, the largest annual production on record up to that year. Of the precious metals the products were: Gold, 33,156 fine oz., value $685,400; silver, 256,000 fine oz., coining value $330,990—total value, $1,016,390. In 1899 the product of limestone for building purposes and lime-making was $139,339, of sandstone $58,395, of granite $42,766, and of marble $4,837. There are productive mineral springs at the Cascades, in Skamania County; Medical Lake, in Spokane County; and North Yakima, Yakima County. Valuable deposits of iron ore are known to exist in the State, but mining operations are in their infancy.

Climate.—The director of the Washington weather service for the U. S. Government says: "For equability and mildness of climate, absence of either very hot or very cold waves, and freedom from destructive tornadoes or cyclones, Washington stands foremost among the favored States of the American Union." The following table shows the mean temperature and mean rainfall in Eastern and Western Washington by months, the averages being deduced from observations extending from two to forty years:

MONTHS.	WESTERN WASHINGTON.		EASTERN WASHINGTON.	
	Mean temperature.	Mean rainfall.	Mean temperature.	Mean rainfall.
January	37·3	7·82	26·3	2·17
February	40·2	6·45	31·4	2·08
March	44·3	5·80	42·6	1·20
April	49·7	3·21	51·0	1.33
May	54·7	2·77	59·4	1·25
June	60·1	1·94	66·0	0·88
July	62·7	0·96	71·6	0·56
August	62·5	1·13	70·6	0·27
September	58 2	3.31	60·6	0·69
October	51·2	4.54	49·6	1·92
November	44·7	6·94	38·6	1·58
December	39·9	7·65	32·2	2·58
Average temperature for year	50·4	....	49·7	....
Total rainfall for year	....	52·52	....	16·51

The mean annual rainfall over the western half of Clallam, Jefferson, Chehalis, and Pacific Counties ranges from 79 to 107 inches. This region is the immediate Pacific coast portion of the State, and comprises about 6 per cent. of the entire area of the State. This immense rainfall occurs during the three winter months, and during the rest of the year the rainfall is not excessive. The Government records are doing much to dispel the erroneous idea that Washington has an excessively rainy climate.

Divisions.—For administrative purposes Washington is divided into thirty-six counties, as follows:

WASHINGTON
BRITISH COLUMBIA
VANCOUVER ISLAND
SAN JUAN
WHATCOM
SKAGIT
ISLAND
SNOHOMISH
CLALLAM
JEFFERSON
KITSAP
MASON
KITTITAS
CHEHALIS
THURSTON
PACIFIC
LEWIS
WAHKIAKUM
COWLITZ
SKAMANIA
CLARKE
KLICKITAT
YAKIMA
DOUGLAS
GRANT
LINCOLN
SPOKANE
STEVENS
FERRY
OKANOGAN
ADAMS
WHITMAN
FRANKLIN
GARFIELD
COLUMBIA
WALLA WALLA
ASOTIN
Seattle
Tacoma
Olympia
Vancouver
Ellensburg
North Yakima
Spokane
Colfax
Dayton
Walla Walla
Goldendale
Scale of Miles
0 10 20 30 40 50 60
County Towns
Railroads
This type indicates a population of 1,000 or over.
Longitude West from Greenwich.

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Adams	5-I	2,098	4,840	Ritzville	761
Asotin	6-K	1,580	3,366	Asotin	470
Chehalis	4-A	9,249	15,124	Montesano	1,194
Chelan	4-F	.....	3,931	Wenatchee	451
Clallam	3-A	2,771	5,603	Port Angeles	2,321
Clarke	7-C	11,709	13,419	Vancouver	4,006
Columbia	6-J	6,709	7,128	Dayton	2,216
Cowlitz	7-C	5,917	7,877	Kalama	554
Douglas	4-G	3,161	4,926	Waterville	482
Ferry	2-J	.....	4,562	Republic	2,050
Franklin	6-H	696	486	Pasco	254
Garfield	6-J	3,897	3,918	Pomeroy	953
Island	2-C	1,787	1,870	Coupeville	495
Jefferson	3-A	8,368	5,712	Port Townsend	3,443
King	4-D	63,989	110,053	Seattle	80,672
Kitsap	3-C	4,624	6,767	Port Orchard	197
Kittitas	4-F	8,777	9,704	Ellensburg	1,737
Klickitat	7-F	5,167	6,407	Goldendale	738
Lewis	6-C	11,499	15,157	Chebalis	1,775
Lincoln	4-I	9,312	11,969	Sprague	695
Mason	4-B	2,826	3,810	Shelton	833
Okanogan	2-G	1,467	4,689	Conconnully	.....
Pacific	6-B	4,358	5,983	South Bend	711
Pierce	5-D	50,940	55,515	Tacoma	37,714
San Juan	1-C	2,072	2,928	Friday Harbor	.....
Skagit	2-D	8,747	14,272	Mt. Vernon	1,120
Skamania	7-D	774	1,688	Stevenson	338
Snohomish	3-D	8,514	23,950	Snohomish	2,101
Spokane	3-J	37,487	57,542	Spokane	36,848
Stevens	2-I	4,341	10,543	Colville	594
Thurston	5-C	9,675	9,927	Olympia	4,082
Wahkiakum	6-B	2,526	2,819	Cathlamet	669
Walla Walla	6-I	12,224	18,680	Walla Walla	10,049
Whatcom	1-D	18,591	24,116	Whatcom	6,834
Whitman	5-J	19,109	25,360	Colfax	2,121
Yakima	6-F	4,429	13,462	North Yakima	3,154
Totals		349,390	518,103		

* Reference for location of counties, see map of Washington.

Principal Cities and Towns, with Population for 1900.—Seattle, 80,671; Tacoma, 37,714; Spokane, 36,848; Walla Walla, 10,049; Everett, 7,838; Whatcom, 6,834; Ballard, 4,568; Fair Haven, 4,228; Olympia, 4,082; Vancouver, 4,006; Aberdeen, 3,747; Port Townsend, 3,443; North Yakima, 3,154; Roslyn, 2,786; Hoquiam, 2,608; Port Angeles, 2,321; Dayton, 2,216; Colfax, 2,121; Snohomish, 2,101; Republic, 2,050.

Population and Races.—In 1860, 11,594; 1870, 23,955; 1880, 75,116; 1890, 349,390 (native, 259,385; foreign, 90,005; males, 217,562; females, 131,828; white, 340,513; colored, 8,877, comprising 1,602 persons of African descent, 3,260 Chinese, 360 Japanese, and 3,655 civilized Indians). There are (1894) in the State 18 Indian reservations with an aggregate area of 7,094,950 acres. Much of the land has been allotted to the Indians in severalty.

Industries and Business Interests.—The principal article manufactured in Eastern Washington is flour, large mills being located at Spokane, Walla Walla, Dayton, Waitsburg, Cheney, and other cities. The chief articles manufactured in Western Washington are lumber, iron, brick, and tile. The census of 1890 showed that 1,543 manufacturing establishments reported. These had a combined capital of $34,369,735, including an investment of $8,766,916 in machinery, tools, and implements. There were 20,366 persons employed, to whom $12,658,614 was paid in wages. Materials used cost $19,917,057, and the output was valued at $41,768,022. SEATTLE and TACOMA (*qq. v.*) were the principal manufacturing cities reporting. Since then the city of Everett has come into existence and has important manufactories in operation. In 1892 there were in operation in the State 227 sawmills, 246 shingle-mills (of which 127 were erected during the year), and 73 sash and door factories. The aggregate annual capacity of the sawmills is 2,970,000,000 feet, and of the shingle-mills 3,723,000,000. The capital invested in these plants is about $30,000,000; total number of employees about 12,000, who receive over $7,000,000 wages yearly. The total output for the year 1892 was 1,164,425,880 feet of lumber, 436,716,000 lath, and 1,883,868,750 shingles. The standing timber of the State is estimated as follows:

DIVISION.	Acres in timber.	Timber standing, feet.	Value.
Eastern Washington	11,616,720	106,978,041,000	$80,426,521
Western Washington	11,971,792	303,355,294,000	189,134,808
Totals	23,588,512	410,333,335,000	$269,561,329

Statistics of salmon canned and packed on the Columbia river have been preserved since 1866. The total to 1893 was 9,323,550 cases. In 1866 the pack was 4,000 cases, and in 1892 465,000 cases. In 1900 the pack was valued at $3,240,460. During 1892 2,081 tons of sturgeon were exported. In the Puget Sound district the value of the fish catch of 1892 was $138,700. There are 335 acres of oyster-beds in the State, from which 560 sacks of oysters are taken weekly. In 1892 the value of the output of the fisheries was $1,176,862, and of oysters and clams $132,840.

Commerce.—In the year ending June 30, 1900, the foreign trade in the Puget Sound customs district was as follows: Exports of gold and silver $980,703, of merchandise $17,903,107; imports of merchandise $7,148,563, of gold and silver $4,972,974. The entrances were, sailing-vessels 378, tonnage 259,488; steam-vessels 1,451, tonnage 844,309; and clearances, sailing-vessels 399, tonnage 287,086; steam-vessels 1,517, tonnage 886,437.

Finance.—The constitution limits the State's indebtedness to $400,000; but in spite of this prohibition the indebtedness in 1897 had reached $2,176,347.64. On Jan. 1, 1901, this had been reduced to $1,392,639.60. The tax levy for State purposes is $6.40 on $1,000. The assessed valuation of real and personal property as equalized by the State officers for 1894 was, real, $183,683,372; personal, $28,747,139—total, $212,430,511; in 1892, however, it was $319,016,341.

Banking.—In 1900 there were 31 national banks with combined capital of $3,250,000, surplus and profits of $1,241,131.86, and deposits of $20,934,488.06; 27 private banks, capital $1,349,960, surplus and profits $222,446, and deposits $7,308,687; and 8 private banks, capital $339,127, surplus and profits $37,952, and deposits $2,933,080.

Post-offices and Periodicals.—In Jan., 1901, there were 860 post-offices, of which 47 were presidential (3 first-class, 6 second-class, 38 third-class) and 813 fourth-class. Of the total, 409 were money-order offices, and 24 were money-order stations. There were 226 newspapers and periodicals, viz., 16 daily, 2 tri-weekly, 1 semi-weekly, 174 weekly, 3 semi-monthly, 28 monthly, and 2 quarterly.

Means of Communication.—The first steam railway built W. of the Rocky Mountains was in Skamania co., Washington. It was a short portage railway around the falls or cascades in the Columbia river, at the town of Cascade. From that beginning very little was done until 1885, when the first transcontinental railway entered Washington. Four great railways have since come into operation, and have their main lines or important branches in the State. The total mileage in 1893 was 2,619, of which 1,244 miles belonged to the Northern Pacific and its branches, and 487, the next largest number, to the Great Northern and branches. The total mileage in 1899 was 2,838·72. The great area of navigable waters has resulted in building up important water transportation enterprises. In 1898 the U. S. Government approved the project for a canal between Puget Sound and Lake Washington. Considerable steamboat business is done on the Columbia and Snake rivers, but the great bulk of water transportation is on Puget Sound, Gray's harbor, and Willapa harbor.

Churches.—The whole State constitutes two missionary jurisdictions of the Protestant Episcopal Church named Washington and Spokane, and a diocese of the Roman Catholic Church, named Nesqually. The census of 1890 reported 882 church organizations, 532 edifices, valued at $2,408,625, 58,798 communicants, and the following statistics of the principal bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic	86	86	20,848	$156,050
Methodist Episcopal	200	195	11,592	652,425
Disciples of Christ	86	88	5,816	93,400
Presbyterian in the U. S. of A.	85	92	3,770	343,175
Congregational	104	103	3,154	316,230
Protestant Episcopal	23	23	1,698	242,800

Schools.—Every section of land numbered 16 or 36 is set aside for the maintenance of public schools. The aggregate is 2,484,480 acres, and none of it can be sold for less than $10 an acre, while much of it will bring several times that price. The proceeds from the sale of these lands constitute an irreducible fund, having a minimum value of $24,844,800, only the interest on which can be used. In 1898 there were 97,916 children enrolled in the public schools, with an average daily attendance of 64,192. There were 1,941 schools and 3,321 teachers—1,033 men and 2,288 women. The average monthly salaries were: Men, $42.13; women, $34.53. The value of school property was $4,977,-

679; revenue for school purposes, $2,094,775; expenditure, $1,795,795. Besides the public schools there are over fifty colleges, endowed academies, and private and denominational schools. The colleges include the University of Washington (see WASHINGTON, UNIVERSITY OF); Colfax College (Baptist), at Colfax; Whitworth College, at Sumner; Whitman College (Congregational), at Walla Walla; and St. James's College (Roman Catholic), at Vancouver. There are State normal schools at Ellensburg and Cheney, and an agricultural college and school of science at Pullman.

Charitable, Reformatory, and Penal Institutions.—The State institutions comprise a Soldiers' Home at Orting, Reform School at Chehalis, hospitals for the insane at Steilacoom and Medical Lake, a School for Defective Youth at Vancouver, and a penitentiary at Walla Walla. There are numerous private and denominational hospitals, orphanages, homes, and other institutions, and a small penitentiary on McNeil's island, belonging to the U. S. Government.

Political Organization.—The constitution provides that the State officers shall be elected for four years at the same elections at which the vote is taken for President of the U. S. Much of the multifarious work of the State government devolves upon boards of trustees or commissioners. Each State institution has a separate board of trustees. There are boards to handle the State lands, to look after the State printing, to equalize the taxes, to appraise the tide lands, to regulate the practice of medicine, pharmacy, and dentistry, and to perform various other duties. These officers, except a few who are *ex-officio* members of certain boards, are all appointed by the Governor. An elector must be a male citizen of the U. S., and must reside in the State one year, in the county six months, and in his voting precinct thirty days before being entitled to vote at any election. For a brief period in territorial days the suffrage was extended to women, but it was withdrawn before statehood, though women are still allowed to vote at school elections. In the State Legislature there are 34 senators and 68 representatives. Half the senators and all the representatives are elected biennially, making the senatorial term four years.

History.—The geographical nomenclature of Washington throws light upon the history of its discovery. Along the seacoast are found names that perpetuate the memory of the earliest Spanish voyages to the Pacific Northwest, such as the Strait of Juan de Fuca and San Juan islands. The greater number of names, as Vancouver Island, Puget Sound, Mt. Rainier, etc., commemorate the more complete work of the English navigator, George Vancouver. Gray's harbor and Columbia river are named after Capt. Robert Gray, and his vessel, the Columbia; he discovered both in 1792 while on the first voyage of exploration in the Pacific Northwest by and for Americans. These discoveries gave the U. S. a claim to at least a large part of the territory now embraced in the State of Washington, but title was not made perfect until 1803, when the Government purchased from Napoleon I. the Louisiana territory, which cleared away the last controversy except trifling differences with Great Britain as to boundaries between the U. S. and British America. The famous Lewis and Clarke overland expedition made valuable discoveries in 1803–05. The Hudson Bay Company long operated in this region, and remains of their forts and buildings still exist. The American Fur Company, John Jacob Astor's Pacific Fur Company, and other enterprises sought this field in the early part of the nineteenth century. Washington was a part of the Territory of Oregon until 1853, when a part was set off and organized as Washington Territory. Two years later white settlers experienced much trouble with Indians in different parts of the Territory. Washington was admitted into the Union as a State Nov. 11, 1889.

GOVERNORS OF WASHINGTON.

Territorial.

Isaac I. Stevens	1853–57
J. Patton Anderson*	1857
Fayette McMullin	1857–59
Richard D. Gholson	1859–61
William H. Wallace	1861
William Pickering	1862–66
George E. Cole	1866–67
Marshall F. Moore	1867–69
Alvin Flanders	1869–70
Edward S. Salomon	1870–72
James F. Legate*	1872
Elisha P. Ferry	1872–80
William A. Newell	1880–84
Watson C. Squire	1884–87
Eugene Semple	1887–89
Miles C. Moore	1889

State.

Elisha P. Ferry	1889–93
John H. McGraw	1893–97
J. R. Rogers	1897–

* Did not qualify.

AUTHORITIES.—There are as yet but few books giving the history of Washington. Hubert Howe Bancroft includes one in his extensive series of the Pacific Coast histories. Others are Hawthorne's *History of Washington, the Evergreen State* (2 vols., New York, 1893); Evans's *History of Pacific Northwest, Oregon and Washington* (2 vols., Portland); Evans and Meany's *Washington, the Evergreen State* (1876); Barton's *Legislative Manual of Washington* (Olympia, biennial). EDMOND S. MEANY.

Washington: town (incorporated in 1779); Litchfield co., Conn.; on the Shepaug river, and the She., Litch. and N. Railroad; 40 miles N. of Bridgeport, 90 miles N. E. of New York (for location, see map of Connecticut, ref. 9–D). It was set off from the towns of Woodbury, Litchfield, Kent, and New Milford; contains the villages of Washington, Washington Depot, Romford, New Preston, Marbledale, and Woodville; is principally engaged in agriculture; and is a summer resort. Pop. (1880) 1,590; (1890) 1,633; (1900) 1,820.

Washington: city; capital of the U. S. of America and seat of the Federal Government since 1800; coextensive with the District of Columbia; on the east bank of Potomac river, 106 miles above its mouth, and 105 miles in a straight line W. of the Atlantic Ocean; in lat 38° 53′ 39″ N. and lon. 77° 2′ 48″ W. of Greenwich (for location, see map of Maryland, ref. 3–E). The District of Columbia is bounded N., N. W., E., and S. E. by Maryland, and W. and S. W. by the Potomac river, which separates it from Virginia. Area, 64 sq. miles.

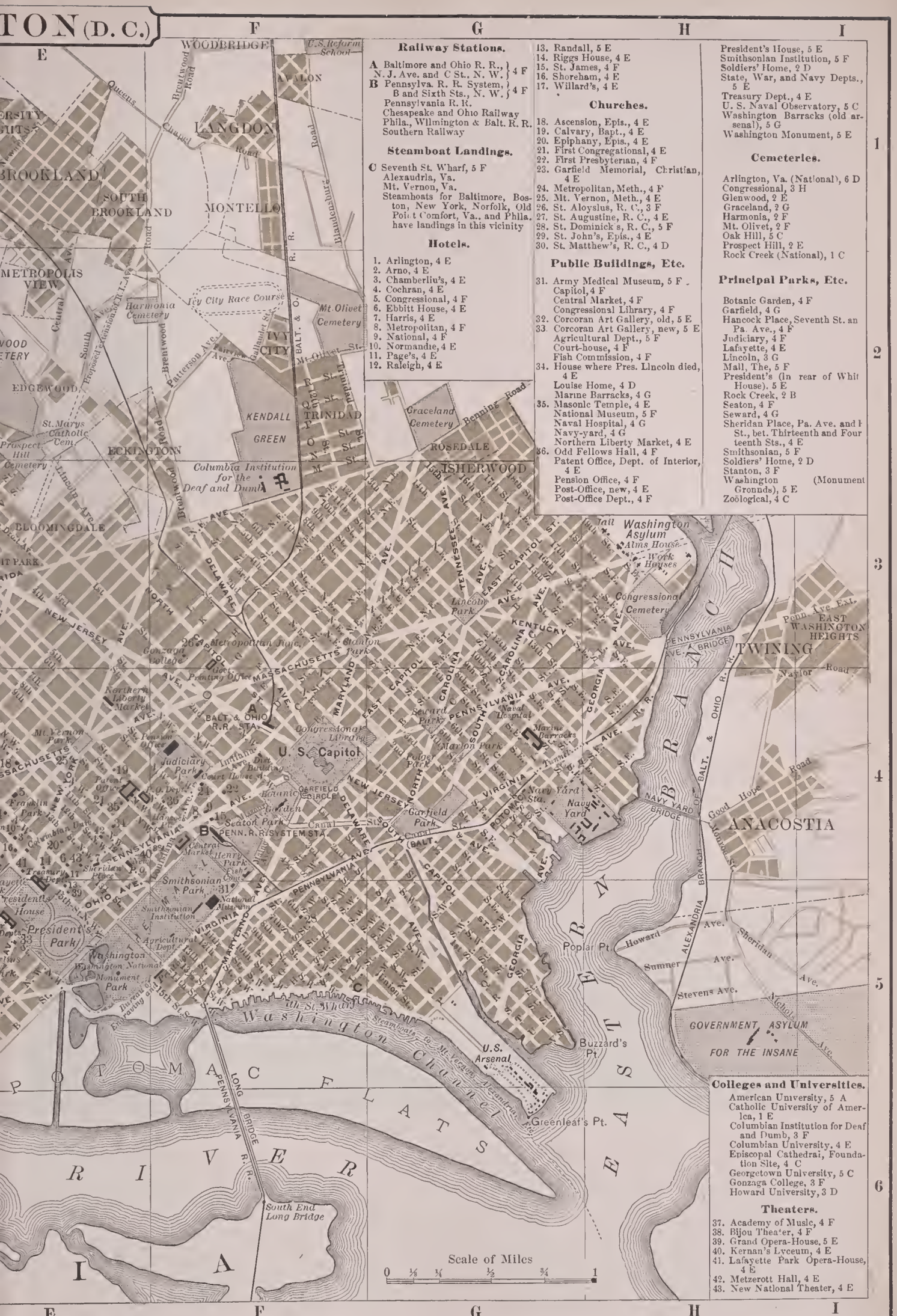
Washington is almost alone among the capitals of great nations of modern times in the fact of its creation for the sole purpose of a seat of government, apart from any questions of commercial greatness or population. While London, Paris, Berlin, St. Petersburg, Vienna, and Madrid are the commercial capitals and the most populous cities of the nations they represent, Washington never was the leading city of the U. S., or the great metropolis of a commercial and manufacturing population. Although located at the head of tidewater navigation, and possessing some natural advantages in the water-power of the Potomac, the city has no natural harbor. In trade and manufactures it is overshadowed by the neighboring commercial cities of Baltimore and Philadelphia, distant only 40 and 136 miles respectively, while New York is but 226 miles distant by railway. As a residence city, however, the capital has unsurpassed advantages.

Washington is connected with the Virginia shore by three bridges. The Long bridge, which has a railway track, and a carriageway for vehicles and pedestrians, is laid on piers. By an act of Congress approved Feb. 12, 1901, Long bridge is to be replaced by a new structure, exclusively for railways, while to the south a separate bridge is to be built for highway traffic. The Aqueduct bridge at Georgetown is now used only for travel to Arlington, Fort Myer, and the Virginia interior. The Chain bridge at Little Falls, 4 miles above, has given place to an iron truss bridge, erected in 1874. Across the Eastern Branch, or Anacostia, runs the Navy-yard bridge, an iron structure erected in 1875, and affording communication with the suburb of Anacostia, and another iron bridge connects Pennsylvania Avenue, E., with Twining City. Benning's bridge, of iron, is about a mile above the navy-yard.

Streets and Avenues.—The streets are from 160 feet to 70 feet wide. The length of the streets and avenues is 264 miles. There are twenty-one avenues bearing the names of States of the Union. Pennsylvania Avenue is a celebrated thoroughfare 160 feet in width, paved with smooth concrete, constituting a splendid and attractive driveway. Massachusetts Avenue, of like width, is over 4½ miles long. East Capitol Street, 160 feet wide, extending from the east front of the Capitol to Lincoln Park, has become one of the most attractive streets. K Street, 148 feet wide, extending from Rock creek, the Georgetown boundary, to the Anacostia, is one of the finest thoroughfares of the city. Sixteenth Street, 160 feet wide, runs from Lafayette Square, opposite to the President's house, due N. to the boundary, whence it is extended into the country. In 1871 an extensive system of sewerage and of street pavements was instituted, the Washington Canal was filled up, and about 260 miles of streets and avenues paved, mostly with smooth asphalt or concrete. Many streets were completely regraded, while in the streets and avenues about 75,000 shade trees have been planted, giving the capital the aspect of a forest city.

The city proper measures 4½ miles by about 2½ miles, and its circumference is 14 miles, there being a water front on

WASHING
TAKOMA PARK
STOTT'S
METROPOLITAN BRANCH OF BALT. & O. R. R.
ROCK CREEK
BRIGHTWOOD
BRIGHTWOOD PARK
ROCK CREEK CEMETERY
Soldiers' Home Cemetery
Catholic Univer of America
ROCK CREEK PARK
PETWORTH
SOLDIERS' HOME PARK
New Reservoir
Howard University
MOUNT PLEASANT
COLUMBIA HEIGHTS
INGLESIDE
LANIER HEIGHTS
MERIDIAN HILL
ZOOLOGICAL PARK
Episcopal Cathedral Foundation Site
WOODLEY PARK
WASHINGTON HEIGHTS
RENO
ARMSLEIGH PARK
CLEVELAND PARK
CLEVELAND HEIGHTS
OAK VIEW
FAIRVIEW HEIGHTS
U. S. NAVAL OBSERVATORY
Oak Hill Cemetery
Meth. Burial Ground
AMERICAN UNIVERSITY HEIGHTS
American University
TUNLAW HEIGHTS
WESLEY HEIGHTS
Holy Rood Cemetery
GEORGETOWN
BURLEITH
Convent of Visitation Grounds
Old Naval Observatory
Georgetown University
PALISADES OF THE POTOMAC
Distributing Reservoir
ANALOSTAN ISLAND
ROSSLYN
Ft. Myer
Arlington Cemetery
POTOMAC
VIRGINIA



Railway Stations.

A Baltimore and Ohio R. R., N. J. Ave. and C St., N. W. } 4 F
B Pennsylva. R. R. System, B and Sixth Sts., N. W. } 4 F
Pennsylvania R. R.
Chesapeake and Ohio Railway
Phila., Wilmington & Balt. R. R.
Southern Railway

Steamboat Landings.

C Seventh St. Wharf, 5 F
Alexandria, Va.
Mt. Vernon, Va.
Steamboats for Baltimore, Boston, New York, Norfolk, Old Point Comfort, Va., and Phila. have landings in this vicinity

Hotels.

1. Arlington, 4 E
2. Arno, 4 E
3. Chamberlin's, 4 E
4. Cochran, 4 E
5. Congressional, 4 F
6. Ebbitt House, 4 E
7. Harris, 4 E
8. Metropolitan, 4 F
9. National, 4 F
10. Normandie, 4 E
11. Page's, 4 E
12. Raleigh, 4 E
13. Randall, 5 E
14. Riggs House, 4 E
15. St. James, 4 F
16. Shoreham, 4 E
17. Willard's, 4 E

Churches.

18. Ascension, Epis., 4 E
19. Calvary, Bapt., 4 E
20. Epiphany, Epis., 4 E
21. First Congregational, 4 E
22. First Presbyterian, 4 F
23. Garfield Memorial, Christian, 4 E
24. Metropolitan, Meth., 4 F
25. Mt. Vernon, Meth., 4 E
26. St. Aloysius, R. C., 3 F
27. St. Augustine, R. C., 4 E
28. St. Dominick's, R. C., 5 F
29. St. John's, Epis., 4 E
30. St. Matthew's, R. C., 4 D

Public Buildings, Etc.

31. Army Medical Museum, 5 F
Capitol, 4 F
Central Market, 4 F
Congressional Library, 4 F
32. Corcoran Art Gallery, old, 5 E
33. Corcoran Art Gallery, new, 5 E
Agricultural Dept., 5 F
Court-house, 4 F
Fish Commission, 4 F
34. House where Pres. Lincoln died, 4 E
Louise Home, 4 D
Marine Barracks, 4 G
35. Masonic Temple, 4 E
National Museum, 5 F
Naval Hospital, 4 G
Navy-yard, 4 G
Northern Liberty Market, 4 E
36. Odd Fellows Hall, 4 F
Patent Office, Dept. of Interior, 4 E
Pension Office, 4 F
Post-Office, new, 4 E
Post-Office Dept., 4 F
President's House, 5 E
Smithsonian Institution, 5 F
Soldiers' Home, 2 D
State, War, and Navy Depts., 5 E
Treasury Dept., 4 E
U. S. Naval Observatory, 5 C
Washington Barracks (old arsenal), 5 G
Washington Monument, 5 E

Cemeteries.

Arlington, Va. (National), 6 D
Congressional, 3 H
Glenwood, 2 E
Graceland, 2 G
Harmonia, 2 F
Mt. Olivet, 2 F
Oak Hill, 5 C
Prospect Hill, 2 E
Rock Creek (National), 1 C

Principal Parks, Etc.

Botanic Garden, 4 F
Garfield, 4 G
Hancock Place, Seventh St. an Pa. Ave., 4 F
Judiciary, 4 F
Lafayette, 4 E
Lincoln, 3 G
Mall, The, 5 F
President's (in rear of Whit House). 5 E
Rock Creek, 2 B
Seaton, 4 F
Seward, 4 G
Sheridan Place, Pa. Ave. and I St., bet. Thirteenth and Fourteenth Sts., 4 E
Smithsonian, 5 F
Soldiers' Home, 2 D
Stanton, 3 F
Washington (Monument Grounds), 5 E
Zoölogical, 4 C

Colleges and Universities.

American University, 5 A
Catholic University of America, 1 E
Columbian Institution for Deaf and Dumb, 3 F
Columbian University. 4 E
Episcopal Cathedral, Foundation Site, 4 C
Georgetown University, 5 C
Gonzaga College, 3 F
Howard University, 3 D

Theaters.

37. Academy of Music, 4 F
38. Bijou Theater, 4 F
39. Grand Opera-House, 5 E
40. Kernan's Lyceum, 4 E
41. Lafayette Park Opera-House, 4 E
42. Metzerott Hall, 4 E
43. New National Theater, 4 E

the Potomac of 4 miles, and on the Anacostia, or Eastern Branch of the Potomac, of 3¼ miles. The area amounts to 6,111 acres, of which the Government reservations comprise 405 acres, while the avenues and streets embrace 2,554 acres, leaving only 3,152 acres to the squares on which private residences are built, which greatly conduces to the public health by the large open spaces and abundant ventilation in every quarter. There are 301 parks or reservations in all, varying from a few hundred square feet to 82 acres. The principal are Washington Park (Monument Grounds), President's Park (in rear of the White House), Smithsonian Park, Judiciary Park, Garfield Park, and Lincoln Park.

The site of the city of Washington is admirably adapted by nature for the building up of an attractive and imposing city. Situated in part on the tongue of land lying at the confluence of two broad rivers, from which the ground rises in natural and not abrupt ridges into the expanded plateau of Capitol Hill, about 100 feet above the Potomac, the surface of the city presents a gentle undulation which gives variety and constant transition of prospect, without producing any obstructions to travel. The city proper is surrounded on the E., N., and W. by an amphitheater of well-wooded hills, embracing in some cases the ancient forest-growth of tall timber, which was but partially cut off or burned on the Maryland side (as on the Virginia) during the ravages of civil war. Viewed from the vantage-ground of the Capitol dome, or from the Washington Monument, the environs of Washington present a landscape of rare beauty and varied effect. The near view includes the mass of the city, thickly covered with dwellings, stores, and shops, intersected by the two great arteries of Pennsylvania Avenue, running to the Treasury, and Maryland Avenue, running westward to the Potomac. At frequent intervals through the perspective of roofs rise the tall spires of churches and the massive white marble and granite edifices of the various Government buildings. Turning westward, the bright broad current of the Potomac—nearly a mile wide opposite the Capitol—sweeps southward, while there comes in on the left, horizon in the direction of Alexandria. The latter little city, with its houses, churches, and shipping lying along the harbor, 7 miles below Washington, is clearly visible, and the river is dotted with the sails of river-craft and with steamers plying up and down. To the N. W., over the roofs of the Executive Mansion and the buildings of the State, War, and Navy Departments, rise the lofty and picturesque heights of Georgetown, attaining, just outside the borders of the District of Columbia, a height of some 400 feet above the level of the sea. To the N. are seen the buildings of Howard University, crowning Seventh Street hill, and beyond, the tower of the Soldiers' Home, a free refuge for the disabled soldiers of the army, comprising a beautiful park of 500 acres in extent. It was this comprehensive view which drew from Baron von Humboldt the remark, as he stood on the western crest of Capitol Hill and surveyed the scene, "I have not seen a more charming panorama in all my travels."

The Capitol, the most conspicuous object in Washington, is constructed in the purely Classic style, with a center and two projecting wings of great extent, and is ornamented on the east front with sixty-eight Corinthian columns. The length of the Capitol is 751 ft. 4 in.; breadth, 121 to 324 feet, covering 3½ acres. From the central building springs a lofty iron dome 135½ feet in diameter, and containing 8,009,200 lb. of cast and wrought iron. The apex of the dome is surmounted by a lantern 15 feet in diameter and 50 feet high, crowned by a bronze statue of Liberty, the height of which is 19½ feet. The total height from the base of the Capitol to the crest of the statue is 285½ feet. The advantageous position, great architectural mass, and harmonious and imposing effect of the Capitol from most points of view have secured for it the almost unanimous praise of the best judges of all countries as the most impressive modern edifice in the world. The material of the central building is Virginia freestone; that of the wings is white marble from Massachusetts; while the fluted marble columns are from Maryland. The total expenditure upon the Capitol for erection, extension, and repairs has been a little over $15,000,000.

Executive Mansion (White House).

joining its broad stream at Greenleaf's Point (where an artillery post of the U. S. army is located, formerly the Government arsenal), the deep current of the Anacostia. To the S., on the heights beyond the Eastern Branch, is seen the long mass of the Government insane asylum building. On the Virginia shore rises a long forest-clad range of hills, amid which may be discerned Arlington Heights, with its pillared edifice erected by George Washington Parke Custis, now occupied by the Government, and the National Cemetery or city of the dead, where 15,000 Union soldiers are interred, while the spire of Fairfax Seminary, 6 miles distant, rises above the The first Capitol was erected on the same site, the corner-stone laid by George Washington Sept. 18, 1793. Before its completion the building was destroyed by the British in 1814. The present central structure dates from 1818 (completed 1827), and the extension or wings from 1851. The corner-stone of the Capitol extension was laid July 4, 1851, and the Hall of Representatives, in the south wing, was first occupied in 1857, and the Senate Chamber in the north wing in 1859. The work was continuously prosecuted during the civil war, until the statue of Liberty crowned the summit on Dec. 12, 1863.

The rotunda is the central attraction of the Capitol, and

is 96 feet in diameter by 180 feet in height to the canopy of the dome above, on the concave interior of which is a mammoth fresco by Brumidi representing allegorical and historical subjects. The eight panels surrounding the rotunda are adorned by historical paintings, four of which are by Trumbull, representing the Declaration of Independence, the surrender of Burgoyne at Saratoga, the surrender of Cornwallis at Yorktown, and Washington resigning his commission as commander-in-chief in 1783. The best embodiment of the sculptor's art in the external decorations of the Capitol is the group by Thomas Crawford on the east front of the Senate wing. This represents the progress of civilization in the U. S. The great bronze doors by Randolph Rogers which adorn the east front entrance of the Capitol represent in sculptured *alto-rilievo* events in the discovery of America and the life of Columbus, while the similar doors in bronze, the main entrance to the Senate wing, designed by Thomas Crawford, represent Revolutionary battles and prominent civic events in the history of the country. The Senate Chamber, in the north wing, is 113 by 81 feet, with seats for 90 Senators, the galleries furnishing room for 1,000 spectators. Staircases of white and colored marble run from the basement to the Senate galleries. The long apartment in the rear of the Senate Chamber known as the Marble Room is constructed wholly of marble, the ceiling resting upon four Corinthian columns of Italian marble, while the walls are of variegated Tennessee marble highly polished. Adjoining the Marble Room is the President's Room. The south wing of the Capitol is occupied by the House of Representatives and its offices. This is the largest legislative chamber in the world, 139 feet by 93 feet. The galleries accommodate about 1,500 persons, while the floor affords ample space for 357 members, each provided with a writing-desk. The Library of Congress occupies the west projection of the central building, and contains over 700,000 volumes. The law department of the library is in the basement of the Capitol. It has 90,000 volumes, included in the above. The Supreme Court-room and offices occupy the old Senate Chamber, in the central building, and rooms adjacent. The old hall of the House of Representatives is in the form of a semicircle, surrounded by columns of variegated marble. This hall was devoted in 1864 to the purposes of a national memorial hall, each State to contribute statues of two of its most distinguished citizens. The States which have already furnished statues are the six New England States, New York, New Jersey, Pennsylvania, Ohio, Michigan, and Illinois. In this hall, too, is the fine piece of sculpture by Franzoni representing the Muse of History on the winged car of Time, with a clock recording the hours.

The Capitol contains, besides these, the historical paintings in the rotunda, and the frescoes, a considerable number of works of art of various merit. At the head of the grand staircase W. of the House is Leutze's large painting representing an emigrant train crossing the Rocky Mountains. A corresponding panel E. of the House holds Carpenter's picture of the signing of the emancipation proclamation. Powell's picture of Perry's victory on Lake Erie is at the head of the eastern staircase in the Senate wing. Two paintings of scenery on the Colorado and Yellowstone by Thomas Moran are in the corridor to the E. of the Senate gallery. Statues of Franklin and Jefferson by Hiram Powers, and of Hancock, Hamilton, and Baker, by Horatio Stone, are among the decorations of the Capitol. Marble busts of all the Vice-Presidents are to be placed in the Senate chamber. The Electoral Commission, a group of historical portraits by Mrs. Fassett, is also exhibited.

The Congressional Library building occupies a square of about 10 acres just E. of the Capitol. It is built of white New Hampshire granite, three stories high, in the Italian Renaissance style, the four-corner pavilions and central front being moderately projected, with forty ornate pillars and capitals. The dimensions are 470 by 340 feet, the building covering 3½ acres. The central feature of the interior is the reading-room, an octagonal or nearly circular hall 100 feet in diameter, its walls decorated with numerous beautiful arches of richly carved marbles, harmonious in tone and color. The book repositories opening out from the reading-room are filled with iron cases or stacks, accommodating 2,000,000 volumes, the ultimate capacity of the whole library building being 4,500,000. There are four great inner courts lined with white enameled brick, and the number of windows exceeds 2,000, rendering this the best-lighted library in the world. Copyright record-rooms, congressional reading-rooms, a lecture-hall, an extensive map-room, and an art gallery of large dimensions, are other features of the building. Numerous statues of men eminent in literature and science and emblematic mural decorations in oil painting and fresco are in the interior.

The Treasury Department, at Fifteenth Street and Pennsylvania Avenue, is an imposing granite edifice in Ionic style, 468 feet by 264, and cost $6,000,000.

The great building of the *State, War, and Navy Departments* is a massive pile of granite architecture in Italian Renaissance style, 567 by 471 feet, and with 4 façades, looking to the E., W., N., and S. respectively. The total cost of the building was about $10,000,000.

The Department of the Interior, best known as the Patent-office building, occupies the entire square between F and G Streets, from Seventh to Ninth. This building is of severely simple though massive proportions, the architecture being pure Doric, modeled after the Parthenon, 453 by 331 feet, with an elevation of 75 feet. In it are located, besides the Patent-office, which occupies the larger portion of its 191 rooms, the Indian office and the office of the Public Lands, together with the offices of the Secretary of the Interior. Cost, $2,700,000.

Immediately opposite the Patent-office is the building formerly occupied by the Post-office Department, but now used by the Interior Department for its bureaus. It is of Maryland marble, 300 feet long by 204 wide, in pure Corinthian architecture. Cost, $1,700,000.

The Post-office Department is in a granite building nine stories high, on the south side of Pennsylvania Avenue, between Eleventh and Twelfth Streets. It is 200 by 306 feet, and the interior plan resembles that of the Pension-office building, namely, a tier of rooms on each floor about an interior court. The city Post-office is in this building.

The Department of Agriculture occupies a large brick building with brownstone trimmings, in Renaissance style, 170 by 61 feet, adjoining the Smithsonian Institution.

The U. S. Naval Observatory is on Georgetown Heights, its white marble buildings being in the purely Classic style. The great equatorial telescope, with an object glass of 26 inches, cost $47,000.

The Court of Claims is in the building at the corner of Pennsylvania Avenue and Seventeenth Street, formerly the home of the Corcoran Gallery of Art, but now the property of the Government.

The Army Medical Museum building, at the corner of Seventh and B Streets, S. W., contains the hospital records of the U. S. army in over 10,000 MS. volumes, and a vast assemblage of curious and instructive specimens representing the effects upon the human body of wounds, morbid conditions, surgical operations, etc. The library of the surgeon-general's office, here deposited, about 100,000 volumes, is by far the most complete medical collection ever gathered.

The Washington Navy-yard, established in 1804, occupies 27 acres on the Anacostia river at foot of Eighth Street, about a mile S. E. of the Capitol. This yard, now disused for the construction of naval vessels, is an important dépôt for the manufacture of ordnance.

The President's house—known also as the Executive Mansion, and popularly called the White House—is on Pennsylvania Avenue, occupying a reservation of about 20 acres, midway between the Treasury and the Departments of State, War, and Navy. It is a plain edifice of freestone painted white, 170 by 86 feet, with a colonnade of eight Ionic columns in front and a semicircular portico in the rear. The grounds are adorned with fountains, flowers, and shrubbery, and form a pleasing retreat in the midst of buildings devoted to commercial and public business. The building is adorned by excellent portraits of the ex-Presidents of the U. S. The largest apartment, known as the East Room, is 80 by 40 feet in dimensions, and 22 feet high. The adjoining Blue Room, an apartment finished in blue and gold, is devoted to receptions, diplomatic and social. The Green Room and Red Room (so called from their furnishings) are each 30 by 20 feet. The rooms of the second floor are occupied by the executive office and the President's secretaries, together with apartments for the presidential family. The first President's house, begun in 1792, was occupied by President Adams in 1800, and was burned by the British army in 1814. The present edifice was constructed 1818–29.

The Fine Arts.—Henry K. Brown's fine bronze equestrian statue of Gen. Winfield Scott, erected in 1874, occupies

The Capitol, Washington, D. C.

New Congressional Library, Washington, D. C.

the circle at the intersection of Massachusetts and Rhode Island Avenues on Sixteenth Street. Ball's bronze statue, in Lincoln Park, emblematic of Emancipation, represents Abraham Lincoln freeing a slave in chains. Greenough's marble statue of Washington, classical in style and colossal in size, is immediately before the east front of the Capitol. Many other bronze statues, of various merit, of military and naval heroes, are located in the public reservations. The finest, as a work of art, is the statue of La Fayette in Lafayette Square, opposite the White House. The only public institution devoted exclusively to the fine arts is the Corcoran Gallery of Art, Seventeenth Street and New York Avenue, opened with a collection of paintings, statuary, bronzes, and casts from the antique in 1873. It was founded by the liberality of William W. Corcoran, and is open to the public free during three days of the week.

The Washington National Monument (erected to commemorate the first President) was begun by an association incorporated by Congress. Its corner-stone was laid July 4, 1848. After an expenditure of $230,000, raised by voluntary subscription, work was suspended. The monument was finished in 1885 under the direction of Col. Thomas L. Casey, U. S. Engineers, in accordance with an act of Congress

Washington Monument.

passed in 1876. It is built of great blocks of crystal Maryland marble lined with blue gneiss, and rests on a foundation 104 feet square and 37 feet deep. The walls at the base are 15 feet thick; at the height of 152 feet, where the new work was begun, they are 12 feet thick; 10 feet higher they are reduced to 8 feet, and at the top to 1½ feet in thickness. The base of the shaft is 55 ft. 5½ in. square; the top of the shaft, at base of the pyramid, is 34 ft. 5½ in. square. The height of this monument is 555 ft. 5½ in., and it is the highest stone structure in the world. The weight of the whole structure, including foundation, is 81,117 tons of 2,240 lb.; cost, $1,187,710. A polished cap of aluminium covers the highest point. Within the monument are an elevator and an iron stairway of 900 steps.

The Zoölogical Park lies along both banks of Rock creek, to the N. W. of the city, comprising 167 acres. The site is extremely picturesque, and the variety of animals and birds here exhibited render it a most attractive public resort.

The Rock Creek Park, an extensive tract purchased by Congress in 1890 for $1,200,000 (one-half paid by the District of Columbia), comprises 1,606 acres, stretching along the winding stream for miles. Its wild natural beauty, grassy slopes, and wealth of forest-trees will render this park, when laid out in attractive drives and rambles, one of the most beautiful and extensive rural resorts in the neighborhood of any city.

The cemeteries of Washington are: Oak Hill Cemetery, on Georgetown Heights, thickly planted with noble forest-trees and shrubbery; the Congressional Cemetery, on the Anacostia river, a mile E. from the Capitol, 30 acres in extent; and Glenwood, Rock Creek, and Mount Olivet.

The Botanical Garden, situated between Pennsylvania Avenue and Maryland Avenue, on the corner of Third Street, foot of Capitol Hill, is a fine collection of trees, shrubs, and flowers from many climes.

The Soldiers' Home, a national institution for invalid soldiers of the regular army, was established in 1851. The buildings are handsome and costly, and the grounds (523 acres), laid out in meadows, groves, and lakes, afford 7 miles of beautiful drives, serving as a free public park for the city of Washington.

Minor Government Buildings.—Among these are the Columbia Institution for the Deaf and Dumb, with its picturesque semi-Gothic buildings, occupying 100 acres in the northeast quarter of the city; the Pension-office, a large structure of brick erected in 1883 on Judiciary Square, at a cost of $400,000; the Weather Bureau, corner of M and Twenty-fourth Streets, N. W.; the Government Printing-office, corner of North Capitol and H Streets, the most extensive printing establishment in America; the Bureau of Engraving and Printing, at Fourteenth and B Streets, S. W., where the national currency and bonds are printed; the Coast and Geodetic Survey, on New Jersey Avenue, near the Capitol; the U. S. Fish Commission building, corner of Sixth and B Streets, S. W.; and the Government Hospital for the Insane, a commodious structure, with several outlying buildings, on the crest of hills opposite Washington, with 419 acres. The Department of Justice, the Interstate Commerce Commission, Bureau of Education, Department of Labor, the Geological Survey, and the U. S. Civil Service Commission occupy rented buildings.

The clubs of Washington are numerous. The largest are the Cosmos Club, the Metropolitan, the Army and Navy, and the Washington Club (a ladies' organization), all of which have separate buildings.

Literary and scientific societies abound, many having large memberships. Among them are the Anthropological Society, the Philosophical Society, the National Geographic Society, the Biological, Chemical, Microscopical, and Woman's Anthropological Societies, the Columbia Historical Society, the Literary Society, the Unity Club, the Shakespeare Club, etc. Of the patriotic societies are the Sons of the American Revolution, Daughters of the American Revolution, Grand Army of the Republic, Association of the Oldest Inhabitants, etc.

Washington has become of late years the foremost city in the Union for conventions of all descriptions—political, religious, philanthropic, economic, medical, scientific, technical, industrial, educational, military, etc. Its ample space and accommodations for an influx of large additions to the resident population, joined to the universal desire to visit the nation's capital, readily account for the fact that the reunions of so many great organizations are held here. Convention Hall holds about 10,000 people, and numerous public halls, opera-houses, and theaters are drawn upon for lectures and public meetings. Nowhere in the country is there such an array of talent on the lecture platform as in Washington. Courses of scientific, literary, historical, musical, and art lectures are organized, many of which are free to the public.

The great value of the scientific establishments of the Government at Washington is recognized throughout the world. Most important among them are the NATIONAL MUSEUM and the SMITHSONIAN INSTITUTION (*qq. v.*). Indeed, the city of Washington, with its great national library, its museums of art and science, its bureau of patent inventions, and other Government exhibits, with the numerous public lectures of the winter season, affords opportunities for instruction unsurpassed elsewhere in the U. S.

Charitable institutions abound in Washington, and many of them have received continuous or occasional aid from the Treasury by act of Congress. The principal are Providence Hospital, a large edifice on Capitol Hill, accommodating 200 patients; Garfield Hospital, National Homœopathic Hospital, and Emergency Hospital; the Louise Home, a fine building on Massachusetts Avenue, erected and endowed by William W. Corcoran, in 1871, for indigent gentlewomen; the Columbia Hospital for Women; the Industrial Home School, the Reform School, the House of the Good Shepherd, the Washington Orphan Asylum, St. Joseph's, St. Ann's, and

St. Vincent's orphan asylums, the Children's Hospital, the Freedmen's Hospital, and the Home for the Aged, under the care of the Little Sisters of the Poor.

The markets of Washington are well supplied. The two principal markets are the Central, erected in 1870, an ornate structure of brick on Pennsylvania Avenue between Seventh and Ninth Streets, and Northern Liberty Market, running from K to L Streets on Fifth, erected in 1874.

The water-supply is brought by a capacious aqueduct from the Great Falls of the Potomac, 16 miles above. It affords 80,000,000 gal. daily, and cost $3,500,000. *The city police* numbers 586 men, at an aggregate cost of about $715,925 a year. *The fire department* employs 252 men and 14 steam fire-engines, and costs about $306,220 annually.

Newspapers.—There are 4 daily, 20 weekly, and 28 monthly, bi-monthly, and quarterly periodicals.

Education.—The schools and universities are summarized under DISTRICT OF COLUMBIA (*q. v.*). The Catholic University of America (founded in 1887) has two extensive buildings of stone and 65 acres of grounds, about 2 miles N. of the city. The American University, to be erected under the auspices of the Methodist Episcopal Church, has a commanding site of 90 acres above Georgetown Heights, 2 miles N. W. of the city. The COLUMBIAN UNIVERSITY (*q. v.*) has widely extended its courses of classical, scientific, and professional study.

Churches.—Of these there are 234 in the District, the Methodists having 62 churches; Baptists, 63 churches; Presbyterians, 17 churches; Lutherans, 14 churches; Episcopalians, 25 churches; Roman Catholics, 18 churches; Congregationalists, 8; Independents, 5; Spiritualists, 3; Jews, 2; Christian Disciples, 3; members of the Reformed Church, 2; Friends, 2; and Adventists, Christian Scientists, Theosophists, Unitarians, Swedenborgians, Plymouth Brethren, Salvation Army, and Universalists, 1 each.

As the political capital of the U. S., Washington enjoys a distinction to which no other American city can lay claim. The vast and varied interests connected with the legislation for a people of 76,000,000, embracing (1901) forty-five States and seven Territories, draw to Washington an annually increasing number of citizens. The number of officers and clerks in Government employ is nearly 15,000.

The members of the diplomatic corps, or foreign ministers resident, with their families, mingle freely with the residents, and many army and navy officers, retired or in active service, find Washington the most agreeable home in the country. Wealth and taste are seen in the numerous fine private residences erected in recent years, and the march of population is overflowing the limits of the city proper and taking possession of the attractive suburbs.

History.—There was a protracted conflict in Congress in 1789–90 over the claims of rival localities for the seat of government, and the present site was selected as a compromise, Philadelphia being made the capital for ten years, while after 1800 it was to be established on the Potomac. After the cession of a Federal district to the U. S. by Maryland and Virginia, the site of the city and the location of the public squares and buildings were selected by President Washington on the Maryland side of the Potomac, in accordance with the act of Congress of Mar. 30, 1791. At the time of this location the city was nearly in the geographical center between the northern and southern limits of the Union. Apr. 15, 1791, the corner-stone of the Federal territory was laid by three commissioners appointed by the President. It was called the "Federal City" by Washington and in the records of the time until Sept. 9, 1791, when the commissioners directed that the Federal district should be called the Territory of Columbia, and the Federal city the city of Washington. Major l'Enfant, a French engineer, prepared the topographical plan of Washington city under the direction of President Washington and Thomas Jefferson, Secretary of State. L'Enfant took as a basis for his design the topography of Versailles, the seat of the government of France, but with large modifications. On Aug. 24, 1814, the city was captured by the British, who burned the Capitol and other public buildings. From 1802 to 1871 Washington was under municipal government, but in the latter year a territorial government was organized for the entire District of Columbia. In 1874 this in turn was abolished, and the government placed in the hands of three commissioners appointed by the President, while Congress assumed direct legislative control over all matters of finance and public improvements. During the civil war of 1861–65 Washington was the center of prodigious military operations. The city was fortified soon after the outbreak of hostilities by a cordon of strong earthworks or forts, 68 in number, having an aggregate perimeter of about 14 miles, and it constituted a great dépôt for military supplies. The question of the removal of the seat of Government westward, or nearer to the present or prospective center of the U. S., is no longer agitated. The present capital, with its storied memories, founded by the first President, whose name it bears, is felt to be a worthy center of the political union of a great people, symbolized by the inscription engraved on the dome of the Capitol—"*E pluribus unum.*"

Pop. (1800) 3,210; (1830) 30,261; (1860) 75,080; (1890) 230,392; (1900) 278,718.

For facts as to the climate, government, finances, education, manufactures, etc., of Washington, see DISTRICT OF COLUMBIA. A. R. SPOFFORD and W. B. BRYAN.

Washington: village; capital of Wilkes co., Ga.; on the Georgia Railroad; 18 miles N. of Barnett, 75 miles N. W. of Augusta (for location, see map of Georgia, ref. 3–I). It is in a cotton and grain-growing region, and has a public school for males, a female seminary, St. Joseph's Academy (Roman Catholic), a State bank with capital of $62,000, two weekly newspapers, and carriage, furniture, and other factories. Pop. (1880) 2,199; (1890) 2,631; (1900) 3,300.

Washington: city; Tazewell co., Ill.; on the Atch., Top. and S. Fé, the Chi. and Alton, and the Tol., Peoria and West. railways; 12 miles E. of Peoria, 21 miles W. of El Paso (for location, see map of Illinois, ref. 5–D). It has a public high school, public library, two private banks, a weekly newspaper, carriage, wagon, and furniture factories, and grain elevators, and is a shipping-point for hogs and grain. Pop. (1880) 1,397; (1890) 1,301; (1900) 1,459.

Washington: city; capital of Daviess co., Ind.; on the Balt. and Ohio S. W. and the Evansv. and Ind. railways; 20 miles E. of Vincennes (for location, see map of Indiana, ref. 10–C). It is an important shipping-point for cannel and bituminous coal, flour, grain, cattle, horses, and hogs, with 9 large coal mines in operation in the vicinity; and has railway machine-shops, 2 national banks with combined capital of $100,000, and a monthly, 2 daily, and 4 weekly periodicals. Pop. (1880) 4,323; (1890) 6,064; (1900) 8,551.
EDITOR OF "GAZETTE."

Washington: city (settled in 1839); capital of Washington co., Ia.; on the Burlington Route and the Chi., Rock Is. and Pac. railways; 51 miles N. W. of Burlington, 75 miles S. W. of Davenport (for location, see map of Iowa, ref. 6–J). It is in an agricultural region, and has 11 churches, high school, an academy that prepares pupils for the junior grade in Western colleges, 2 national banks with combined capital of $200,000, 2 State banks with capital of $75,000, a monthly and 3 weekly periodicals, and manufactories of carriages, machinery, pipe-organs, and cob pipes. Pop. (1880) 2,949; (1890) 3,235; (1900) 4,255. EDITOR OF "GAZETTE."

Washington: city; capital of Washington co., Kan.; on Mill creek, and the Burl. Route and the Mo. Pac. railways; 25 miles N. W. of Waterville, 22 miles W. by S. of Marysville (for location, see map of Kansas, ref. 4–G). It is in an agricultural and stock-raising region, contains a Friends' Academy, public high school, 2 national banks with capital of $112,100, and 2 private banks, and has 2 weekly newspapers. Pop. (1880) 675; (1890) 1,613; (1900) 1,575.

Washington: town; St. Landry parish, La.; on the Bayou Courtableau, and the S. Pac. Co.'s Railroad; 6 miles N. of Opelousas, the county-seat, and 170 miles N. W. of New Orleans (for location, see map of Louisiana, ref. 10–D). It is at the head of navigation on the bayou, and has 3 churches for white people and 2 for colored, graded public school for white children, 3 private schools for colored, a State bank with capital of $40,000, a weekly newspaper, 2 sawmills, cotton-mills, cotton twine and yarn factory, 2 brick-works, and a tile-factory. Much cotton, corn, rice, and sugar-cane are shipped from here. Pop. (1880) 1,194; (1890) 1,064; (1900) 1,197. EDITOR OF "POST."

Washington: town (incorporated as Putnam in 1811, name changed in 1823); Knox co., Me.; 22 miles N. W. of Rockland, 24 miles E. by S. of Augusta (for location, see map of Maine, ref. 9–D). It contains the villages of Washington, West Washington, Globe, Razorville, and Stickney Corner, and has five churches, a high school, and manufactories of carriages, undertakers' supplies, lumber, barrels, casks, staves, headings, and cabinet work. Pop. (1880) 1,249; (1890) 1,230; (1900) 1,019.

Washington: city; Franklin co., Mo.; on the Missouri river, and the Mo. Pac. Railway; 54 miles W. of St. Louis (for location, see map of Missouri, ref. 5–L). It has Lutheran, Methodist Episcopal, Presbyterian, and Roman Catholic churches, Lutheran high and graded schools, Roman Catholic convent (with young ladies' seminary), parochial school, a State bank with capital of $50,000, and a daily and three weekly newspapers. There are manufactories of flour, lumber, leather, shoes, musical instruments, and cob pipes, and, near the city, an extensive bank of fire and potter's clay. The city is a shipping-point for wheat, corn, and packed beef and pork. Pop. (1880) 2,421; (1890) 2,725; (1900) 3,015.

EDITOR OF "FRANKLIN COUNTY OBSERVER."

Washington: borough; Warren co., N. J.; on the Morris Canal, and the Del., Lack. and West. Railroad; 13 miles N. E. of Easton, Pa., 60 miles W. of Newark (for location, see map of New Jersey, ref. 2–C). It is in an agricultural region on the south side of Scott Mountain, and has 6 churches, public schools with fourteen teachers, a national bank with capital of $100,000, improved water-works, electric lights, silk-mill, 5 piano and organ factories, 3 hotels, and a bi-weekly, a monthly, and 2 weekly periodicals. Pop. (1880) 2,142; (1890) 2,834; (1900) 3,580.

EDITOR OF "STAR."

Washington: town, capital of Beaufort co., N. C.; on the Atlantic Coast Line Railway; 128 miles E. by S. of Raleigh, the State capital (for location, see map of North Carolina, ref. 3–J). It is at the head of Pamlico river, 80 miles from the ocean, and accessible to vessels drawing 8 feet of water, and has a large wholesale trade with the West Indies, and considerable fishing and trucking interests. There are barrel, sash, harness, and ice factories, lumber, planing, and grist mills, grain-elevator, a State bank with capital of $50,000, an incorporated bank with capital of $25,000, and a semi-monthly and two weekly periodicals. Pop. (1880) 2,462; (1890) 3,545; (1900) 4,842. EDITOR OF "GAZETTE."

Washington: city; capital of Fayette co., O.; on Paint creek, and the Balt. and O., the Cin. and Musk. Val., the Cin., Ham. and Dayton, and the Ohio S. railways; 35 miles S. E. of Springfield, 77 miles N. E. of Cincinnati (for location, see map of Ohio, ref. 6–E). It is in an agricultural region, and has a national bank with capital of $50,000, 2 private banks, a daily and 4 weekly newspapers, planing and woolen mills, boot and shoe, wheel, ice, and soap factories, flour-mills, etc. Pop. (1890) 5,742; (1900) 5,751.

Washington: borough; capital of Washington co., Pa.; on Chartiers creek, and the Balt. and O., the Penn., the Pitts., Cin., Chi. and St. L., and the Waynes. and Wash. railways; 31 miles S. W. of Pittsburg, 32 miles N. E. of Wheeling, W. Va. (for location, see map of Pennsylvania, ref. 5–A). It is in a bituminous coal and natural-gas region, and is the site of the WASHINGTON AND JEFFERSON COLLEGE (*q. v.*), the Lemoyne crematory, Washington Female Seminary, and Trinity Hall school; there are also a high school, a public library, 3 national banks, 2 private banks, a monthly, a quarterly, 2 semi-weekly, 2 weekly, and 3 daily periodicals, and manufactories of brass, malleable iron, tubes, pipes, carriages, and glass. Pop. (1880) 4,292; (1890) 7,063; (1900) 7,670.

Washington, BOOKER T.: See the Appendix.

Washington: BUSHROD, LL. D.: jurist; nephew of George Washington; b. in Westmoreland co., Va., June 5, 1762; graduated at William and Mary College 1778; studied law with James Wilson at Philadelphia; began practice in his native county 1780; served as a private soldier at Yorktown 1781; was a member of the Virginia house of delegates 1787, of the Virginia convention to ratify the U. S. Constitution 1788; afterward practiced law at Alexandria and at Richmond; was appointed by President Adams an associate justice of the U. S. Supreme Court Dec. 20, 1798 (which office he held until his death); inherited from his uncle the Mt. Vernon estate 1799; was the first president of the American Colonization Society. He published *Reports of the Virginia Court of Appeals 1790–96* (2 vols., 1798–99) and *Reports of the U. S. Circuit Court, Third Circuit, 1803–27* (4 vols., 1826–29), the latter being edited by Richard Peters. D. in Philadelphia, Nov. 26, 1829.

Washington, GEORGE: soldier and statesman, and first President of the U. S. of America; b. in Washington parish, Westmoreland co., Va., Feb. 22 (N. S.), 1732, son of Augustine Washington by his second wife Mary Ball. The family was one of wealth and high rank in Virginia, the first member, John Washington, having migrated from England in 1657. Augustine, by his first marriage, left a son Lawrence, whom he made his principal heir and the guardian of his son George. Lawrence, however, died while George was still young, and soon after, on the death of his young daughter, George inherited the whole estate.

Early Life.—Of the details of George Washington's early life very little is positively known. His early biographer, Weems, wove a web of anecdotes about his boyhood; but the stories which rest upon this authority are for the most part apocryphal. It is certain he was never the prig represented by Weems. When he was only about four years old he was placed in charge of one Hobby, a sexton of the parish, who taught him his letters and not long after sent him to a school kept by a Mr. Williams. Here he received an ordinary common-school education, with no instruction in any language, ancient or modern, except English. The mysteries of English orthography he never fully mastered; but in mathematics he was more successful. He matured early, was a tall, muscular boy, could outrun and outride any of his fellows, and was universally recognized as a leader in athletic sports, as well as in social life. When he was eleven his father died, and his education was thenceforward in the hands of his mother. And no small task it was; for there were many acres, a considerable number of slaves, very little money, and five children. At fourteen there was serious talk of his going to sea on a tobacco-ship, but the plan was not approved by the mother and was abandoned. His aptitude for mathematics opened the way to one of the most immediately profitable pursuits then available to a young man, that of surveyor. Accordingly, he studied for two years more with Mr. Williams, and was so successful in his work that at sixteen he was ready to enter upon this new vocation. There is abundant evidence that he had remarkable soberness and strength of mind even at this early period. His manuscript papers of the time show the same painstaking care that characterized the work of all his later years. Still more important is the fact that he found and copied out from an English book 100 rules for behavior, which were singularly characteristic of his later methods. (See Sparks, *Writings of Washington*, ii., 412.) The great lesson of these rules in all the relations of life was self-control, a characteristic which even at that age Washington began to show in very marked degree. That he was regarded as a lad of unusual promise is evinced by the confidence shown by Lord Fairfax. This gentleman, who had come into possession of vast tracts of territory in different parts of the State, not only showed unusual interest in Washington, but intrusted to him the entire responsibility of surveying these lands. It was within a month after his sixteenth birthday that he set out with his surveying party to do this work. His notes and diary were kept with great fullness and painstaking care; and so admirably was his work performed that Fairfax secured his appointment as public surveyor, a position which gave authority to his surveys and secured him steady work. This manly and robust vocation occupied him for three years. He had now acquired his full stature of 6 ft. 2 in., his frame was broad and firmly knit, and he already had that reputation for remarkable physical strength which he carried through life. In 1751 he accompanied his invalid brother Lawrence to the West Indies, where he was prostrated with smallpox; but he returned in 1752 to enter upon more responsible duties on the death of his brother.

Early Military Experience.—George at nineteen had been appointed one of the adjutants-general of the colony, and under a Dutch soldier of fortune had studied the art of war, including tactics and the manual of arms. Affairs on the frontier grew so serious that in Oct., 1753, he was intrusted with the responsible leadership of a company of frontiersmen to ascertain the nature of the difficulties between the British, the French, and the Indians about the sources of the Ohio. His work was so admirably done that his praise was in every mouth, and he was the hero of the hour. The report indicated war, and Washington was at once appointed lieutenant-colonel of a Virginia regiment. In Apr., 1754, he set out with two companies for Mill's creek, where he arrived three weeks later, and found that the French in overwhelming numbers had swept down upon the British and captured the fort. This he regarded as a declaration of war, and pushed at once into the heart of the enemy's territory. Soon coming upon Jumonville and his party, who were out on a spying expedition in the hope of surprising the British, he brought on an action in which ten of the French were killed and twenty-seven

taken prisoners. Throughout the expedition one of the commander's most conspicuous characteristics was his personal courage. At one time he led 150 raw recruits into an open field where he knew he was surrounded by 1,000 French and Indians; and at all times he was ready to give battle at any odds with confidence and pleasure. It is impossible not to conclude, save in the light of results, that his conduct was rash in the extreme. Washington's friend, the celebrated Seneca chief Half-King, said that "the English acted like fools, and the French like cowards." It was doubtless the utter indifference of Washington and his troops to danger that created the apparent timidity of the French. Be that as it may, the expedition, though wild from the outset, showed that the commander was possessed of extraordinary personal courage, of perfect self-control, and of unhesitating self-reliance. He never asked or encouraged advice, he never lost his complete self-possession, and he wrote that he "loved to hear bullets whistle." At the end of the campaign he resigned his commission from indignation at a British order for assigning all provincials to subordinate rank in the presence of British officers.

But the flames of war were now bursting out in every direction. In Feb., 1755, Gen. Braddock arrived in Virginia at the head of two regiments, and, hearing of Washington's exploits and popularity, he offered him a place on his staff with the rank of colonel. The post was gladly accepted. Braddock was a veteran soldier and a rigid disciplinarian, but he was contemptuous of provincial methods and scorned to modify his plan of warfare. He not only refused to adopt the customary precautions against surprise, but declined to throw his men into the woods as advised by Washington. The well-known result was inevitable. When the army reached the valley, still known as Braddock, June 16, 1755, bullets and arrows began to be poured in by unseen enemies in the surrounding woods. The troops were thrown into the utmost confusion, and the death of Braddock threw upon Washington the responsibility of commanding the disorganized troops, of gathering up the remnants of the army, and of conducting the retreat. This was done with such bravery, discretion, and success as greatly to raise a reputation which had already become national. He threw himself headlong into the fight, and rode up and down the field, striving to rally the "dastards" as he characterized the regular troops. Though he dashed hither and thither, everywhere exposed to fire, and everywhere calling upon the troops to rally, all his efforts were in vain. Two horses were shot under him, and four bullets passed through his coat. In spite of all his efforts the troops broke in confusion, and it was with difficulty that they brought away the dying general.

Soon after his return to Mt. Vernon he was offered the command of all the Virginian troops on his own terms; but during the next three years his duty was confined to the protection of the frontier, which extended nearly 400 miles and was constantly subject to assault by a crafty and savage enemy. It was a trying experience, but one without brilliant results. When at length the policy of Pitt had conquered the French in Canada, Washington led the force which took formal possession of the upper waters of the Ohio and changed the old French fort Duquesne into the British fort Pitt. Immediately after this expedition he was married, Jan. 6, 1759, to Martha Dandridge, the widow of Daniel Parke Custis, a lady with youth, beauty, and a large fortune. Thus before he was twenty-seven he was the foremost soldier on the continent, was most widely and favorably known, and was one of the richest men in the country.

During the next sixteen years Washington's life was that of a successful and influential Virginia planter. He owned a large number of slaves, and he managed them with characteristic skill. He exacted obedience with a kind of military discipline, and to this fact has been attributed his remarkable success as a planter. It is said that he never bought or sold a slave, simply raising and keeping those that were born on his numerous estates. He gave to all his private affairs the most painstaking personal attention, as his MS. notes amply show. He was fond of every outdoor sport, and was a fierce rider after the hounds, of which he always kept an ample supply. He was universally known as a peace-loving man, but one possessed with a dangerous temper that would blaze out now and then against any form of injustice, oppression, or impertinence. But he was always ready to serve the State. A member of the House of Burgesses, he took a prominent part in all the differences that were soon to culminate in the Revolution.

Attitude toward the Causes of the Revolution.—His correspondence shows that in the Stamp Act he saw evidence of folly that would soon create an irreparable breach between the countries; and in the act of repeal he did not fail to see the dangerous reservation it contained. While not an agitator in any sense of the word, he was a careful observer, and his letters show that his judgment was seldom at fault in regard to the consequences of the various steps taken. In 1769 he wrote to George Mason: "That no man should scruple or hesitate a moment to use arms in defense of so valuable a blessing, is clearly my opinion. Yet arms, I would beg leave to add, should be the last resource, the *dernier ressort.*" He was thus fully committed to the policy of war if war should be necessary to secure the cause of the colonies. His hopes of peace, moreover, gradually faded away. At the various meetings held in Virginia he was called to preside and gave tone to the declarations. His letters reveal the steady growth of his fighting spirit. The convention chose him as one of the six delegates of the State to the Continental Congress.

Washington took very little public part in the proceedings of Congress; but his letters show that he was active in the work of forming and ascertaining public opinion. Though seldom heard in public speech he gradually acquired the reputation of being the wisest man in the House. His letters assert that it was not the wish of any of the colonies to secure independence, but to a royalist friend in Massachusetts he wrote, "But this you may at the same time rely on, that none of them will ever submit to the loss of those valuable rights and privileges which are essential to the happiness of every free State"; and he added that in his opinion "more blood will be spilled on this occasion if the ministry are determined to push matters to extremity than history has ever yet furnished instances of in the annals of North America." His letters soon begin to contain expressions showing that he now regarded the violent separation of the colonies from the mother country as inevitable. In the second Continental Congress he appeared in his uniform of a Virginia colonel, and to a friend in England he wrote that "the peaceful plains of America are either to be drenched with blood or inhabited with slaves."

Commander-in-Chief.—In the spring of 1775 the events at Lexington and Concord occurred, and on June 15 Congress, on the motion of John Adams, adopted the army, and unanimously made Washington commander-in-chief. On the next day he accepted the position with great solemnity, declaring that as no pecuniary consideration would have induced him to undertake the work, he must decline all pay and emoluments, only relying upon Congress to defray his expenses. It is evident that he realized, as no other did, that with troops undisciplined, untrained, and unprepared for war, without money, without arms, without credit, and without allies, he was to face the best troops in Europe. On June 21 he set out to assume command of the army. At Newark, at New York, and at Watertown he was met by enthusiastic delegations who formally welcomed him, and on July 3 he assumed command of the first American army under the historic elm-tree at Cambridge.

The Boston Campaign.—It appeared at once that Washington had the faith and the sympathy of the army as well as of the people. But when he came to number the forces he found only 14,000 instead of the 20,000 accredited by public report. He wrote of the army as "a mixed multitude of people, under very little discipline, order, or government." But he rapidly brought order and regularity out of confusion. He carefully distributed and wisely posted the forces in strong intrenchments. He resorted to vigorous measures in order to restore discipline. In one of his letters he says: "I have made a pretty good slam amongst such kind of officers as the Mass. government abounds in, since I came into this camp, having broke one colonel and two captains for cowardly behavior in the action on Bunker Hill, and two captains for drawing more pay and provisions than they had men in their company. . . . Besides these, I have at this time, one colonel, one major, one captain, and two subalterns under arrest for trial." Besides these difficulties he showed that as yet there was no commissary department, there were no uniforms, no small-arms, no cannon, no resources to draw from, and no arrangements for ammunition. To teach Congress the necessity of providing for all these was no small part of his work. In August it was found that there were only nine rounds of ammunition to a man. Couriers were sent from village to village, and a vessel was dispatched to the Bermudas to seize

a supply of powder. Notwithstanding all these discouragements he gradually drew his lines about the landward side of the city, and in September proposed to his officers a general attack. They unanimously opposed the plan, and it was abandoned. In the following month he repeated the proposal, with the same result. In February, however, he could no longer be held back. In the night of Mar. 4 he moved a strong body of troops to Dorchester heights under cover of a brisk cannonade, and in the following morning was strongly intrenched. The British commander, Howe, saw at once that this movement had made his position untenable, and on Mar. 17 the British evacuated the city by taking refuge in their ships. Having thus gained complete possession of Boston, Washington moved with a large part of his army to New York, where he arrived on Apr. 13.

The New York Campaign.—Sir William Howe, after evacuating Boston and putting his forces in order at Halifax, sailed, as Washington had anticipated, for New York. It soon became evident that the British plan of campaign was to take possession of the Hudson, and, by so doing, cut off New England from the rest of the country. The failure of the expeditions of Montgomery and Arnold against Quebec had left the way open for an invasion from Canada by way of the St. John river and Lake Champlain. Accordingly, two expeditions were now planned. Gen. Sir Guy Carleton in the summer of 1776 ascended the St. John and advanced southward as far as Valcour island, where he met an American fleet under Benedict Arnold. In the engagement that ensued, Oct. 11, his fleet was so disabled that he turned about and went into winter quarters at Montreal. The other movement was far more formidable. Gen. Howe with a force of 25,000 men took a position on Staten Island, just S. of New York, and had the support of a powerful fleet in command of his brother, Lord Howe. Washington, in order to protect and command the city, had intrenched a force of 5,000 men under Gen. Putnam on Brooklyn Heights, and, in consequence of the sickness of Greene, had placed Sullivan with some 5,000 men to guard the approaches from the S. and E. On Aug. 27 Howe attacked Sullivan with an overwhelming force, and Sullivan, with about 1,000 of his troops, was taken prisoner. Howe, not venturing to attack Brooklyn Heights directly, determined to resort to a siege. Washington, perceiving the danger and observing the preparations for an attack front and rear, determined upon the bold hazard of withdrawing his army to New York. In the course of two or three days boats and scows from all quarters were brought together within sight and hearing of the enemy, and one dark foggy night he transported his whole force of 9,000 men with all their munitions.

By this movement, however, though the army was saved, the difficulties of the situation were scarcely diminished. The British army was more than twice as large as the American; the fleet had command of the bay and the river; the periods of enlistment were constantly expiring, and it seemed impossible to secure recruits enough to take the vacant places; Congress acted slowly, and had no adequate means of enforcing its measures; New York was full of British adherents; and an elaborate plot for a Tory uprising was soon discovered, with the purpose of assassinating the commander-in-chief, which was not fully subdued until the leader was publicly hanged.

The British soon secured a footing at Kip's Bay (about the eastern end of Thirty-fourth street), and threatened by advancing across the island to cut off Washington's retreat. A little later Howe landed at Throgg's Neck, 9 miles further up, and Washington, though repelling the enemy at every point, found it necessary gradually to withdraw northward. At White Plains Howe attempted to bring on a general action, but without success. Washington resisted every advance, but fought behind strong intrenchments, and, always retreating before a general assault could be made, kept the main force of his army untouched. But the advance was constantly, though slowly, northward, and Washington now found it necessary to retreat into New Jersey. The congressional committee on the war declared that Forts Washington and Lee must be held. The commander favored their abandonment, but unfortunately left the final decision in regard to Fort Washington to Gen. Greene, who determined upon resistance. The fort was taken by storm and nearly 3,000 troops were made prisoners. This great disaster had a depressing effect on all parts of the country. The enemy regarded the war as practically closed; and Washington, leaving the British in undisputed control of New York, retreated into the heart of New Jersey. When he reached Princeton, with the enemy close on his heels, Dec. 2, he had only about 3,000 men.

The New Jersey Campaign.—The situation seemed desperate indeed. Gen. Charles Lee, an English adventurer, who had been placed second in command of the American army, persisted, contrary to orders, in remaining for a long time E. of the Hudson. Washington was thus deprived of his help, and when finally he crossed the river, his line of retreat was by a northerly route through Morristown, and he paid little attention to the orders of Washington summoning him and his forces to join the main army. Lee was soon taken prisoner, and the papers of Howe's private secretary, examined eighty years later, showed that he was a traitor to the American cause at the time of his capture. Howe issued an amnesty, and signs of wavering began to be seen in all parts of the country. Newport was in the hands of the enemy, Philadelphia was threatened, and the letters of appeal for men and money sent out by Washington in every direction brought few responses. But Washington himself, though his letters plainly reveal the gravity of the situation, never lost heart. The enemy, thinking him now within easy grasp, halted in the pursuit for a day or two; but on resuming the advance found that he had not only crossed the Delaware, but had cut off pursuit by destroying all the boats within 70 miles. Howe, leaving strong detachments at various points in the front, withdrew to New York in the confident belief that the American forces would melt away in the course of the winter. But no sooner was it known that Howe had gone than Washington determined to assume the offensive. Though he had in all his divisions only about 6,000 men, and the enemy had 25,000, he determined, in the dead of winter, to recross the Delaware and strike a blow at Trenton. To each of the divisions an exact part was assigned. Gates was to advance from Bristol; Ewing was to cross at Trenton; Griffin was to advance against Donop; and Putnam was to come up from Philadelphia. For one reason or another every one of them failed. But Washington himself, undaunted by the fact that the river was full of floating ice, threw his own division of 2,400 men across, and, after marching 9 miles in the face of a furious storm of snow and sleet, fell upon the city at daybreak. Sullivan sent word that the arms were wet, and that they could not fire. "Then tell the general to use the bayonet, for the town must be taken," was the reply. Washington, at the front of the line, swept down the Pennington road; Stark led up the van of Sullivan's force from the bank of the river; the enemy was thrown into immediate confusion, and Washington recrossed the river with 1,000 prisoners. The brilliancy and success of this action not only revived the drooping spirits of the Americans, but greatly alarmed the British. Gen. Cornwallis was at once sent out from New York with 7,000 men to administer fit punishment to such audacity. Stationing three regiments at Princeton, he advanced to meet Washington himself. The Americans posted themselves beyond the Assunpink river, and were drawn up in line of battle when at nightfall Cornwallis approached. Sure of the game, the British decided to delay the attack until morning. Washington, instantly perceiving the opportunity, decided to take advantage of the mistake. Lighting and leaving camp-fires all along the line, he began a circuitous march upon Princeton. At sunrise his force surprised the town. The British fought vigorously; but Washington led the charge in person, and the enemy was defeated with a loss of 500 killed, wounded, and prisoners. The enthusiasm aroused among the colonies by this brilliant movement was such that the British outposts were soon attacked in all directions, and the main force was obliged to withdraw to the immediate vicinity of New York. This winter's campaign may be said to have saved the Revolution.

In the spring of 1777 the British entered upon a still more elaborate design for obtaining possession of the entire line of the Hudson and Lake Champlain. The design of the British contemplated three distinct movements, all directed to the same end. Gen. Burgoyne was to ascend the St. John river from Montreal to take possession of Lake Champlain and the upper Hudson; Gen. St. Leger was to advance up the St. Lawrence into Lake Ontario, and by landing at Oswego arouse the Indians of Central New York for an attack from the W.; and Gen. Howe, by dividing his army into two parts, was to advance up the Hudson with one division, while with the other he was to move upon Philadelphia. This formidable plan was frustrated by the extraordinary skill and energy with which Washington

beset the forces of Howe. Posting himself near Brunswick with 9,000 men, he was ready to strike N. or S. as there might be need. On May 31 Howe moved out of New York with 100 sail. Before going far, however, re-enforcements arrived from Germany, and he decided to land and advance by way of New Jersey. Washington at once pursued and harassed him with such energy that he was obliged to evacuate New Jersey and return to New York and Staten Island. It was not until July 22 that he was ready once more to sail. Washington, learning that the fleet was now moving south, crossed the Delaware for the purpose of defending Philadelphia. Howe went as far S. as the Chesapeake. Washington had now gathered from various sources as many as 11,000 men with which to defend the city against 18,000. Marching through Philadelphia for the purpose of convincing the inhabitants that he had an army, he took up a strong position on the left bank of the Brandywine to contest the passage. Owing to an oversight of Sullivan the fords on the right were not protected, and Cornwallis, by a long detour, was able to attack him on the flank. He was disastrously defeated, Sept. 11; but the advantage was not followed up, and Washington withdrew his army in good order. Howe at once took possession of Philadelphia, placing the greater part of his force at Germantown, just N. of the city. Washington, after gathering together the fragments of his army, and finding them in good spirits, determined once more to bring on a battle. In the night of Oct. 3 he moved from the direction of Lancaster with about 8,000 men, and opened the attack at daybreak on the 4th at Germantown. All went prosperously for a while, but just at the moment of complete victory an unaccountable panic seized some of the new recruits and victory became defeat. The British were unable to follow up their advantage, and when the skies were cleared it was obvious that they were in no better condition than they had been when the campaign began. The fighting qualities of the Americans made a profound impression on the court of France. St. Leger's expedition had failed in August, and four days after the battle of Germantown Burgoyne with his army of nearly 7,000 surrendered at Saratoga. It was these events that brought the long-hesitating French to a recognition of the independence of the colonies. The former in the treaty bound themselves to send a fleet and supplies, and the latter bound themselves not to lay down arms till Great Britain should acknowledge their independence. Unfortunately, supplies did not arrive from France in time to prevent terrible suffering on the part of Washington's army during the winter of 1777–78 at Valley Forge. It was not until May 6 that the treaty was announced to the army.

The greatness of Washington never appeared at better advantage than in the period that followed. The difficulties that beset his position were manifold. During the whole of the war the terms of enlistment had been so short that the army at any given moment was made up largely of new and untried men; and as periods of enlistment were constantly expiring, it was often impossible to know how the ranks were to be refilled. But for Washington's constant foresight and his habit of sending letters of appeal in every direction, his army would have melted away, as did that of Gates after the defeat of Burgoyne. Another source of constant annoyance was the persistence of foreign adventurers. American agents in Europe in their zeal for the cause had given altogether unwarranted assurances of rank and promotion. If these assurances had been honored, the army would have been officered from top to bottom by foreigners. Washington had the foresight to perceive that such a course would take all spirit out of the cause and all heart out of the men, and therefore he resolutely refused to burden the army with foreign appointments. A far greater source of danger was in the army itself. There was a thoroughly organized plot to drive Washington from his position and place Gates in his stead. The argument of the cabal was simply that the army of the north had been successful; the army of Washington had fought on the defensive, and in its efforts to overwhelm the enemy had accomplished nothing. By putting Gates in his place, Howe, Cornwallis, and Clinton might be driven to the fate of Burgoyne. As it was known that Congress would not remove Washington, reliance was placed upon innuendoes and insult, in the hope that he would resign. The correspondence of the time shows that the "Conway cabal" reached out into every branch of the service. The calm and sometimes freezing dignity with which Washington refers to the matter in his letters affords a remarkable commentary on his character. With all his high-spirited sensitiveness, it was evident that nothing but death or a prison, or the authority that had appointed him, could remove him.

In the spring of 1778 Sir Henry Clinton, who had succeeded Howe in command of the British army, showed a little more energy, though no more capacity, than his predecessor. He was so hard pressed that he found it necessary to evacuate Philadelphia and return to New York. Washington, determined to fight whenever there was the least chance either of defeating or harassing the enemy, fell upon him at Monmouth in one of the most hotly contested battles of the war. Gen. Charles Lee, whose traitorous correspondence was not at that time known, had been exchanged, and was sent forward by Washington in charge of a division to open the battle. Lee ordered a retreat almost as soon as the firing began; but Washington, coming up in a torrent of rage, ordered Lee to the rear, and with great difficulty succeeded in staying what threatened to be an overwhelming rout. Riding furiously from one regiment to another, he brought order out of confusion, and little by little restored the line. The enemy were pushed back until, when darkness came on, the Americans were in possession of the field. The next morning it was found that Clinton and his army had pushed on to New York. For his conduct on the field Lee was tried by court martial and dismissed from his command.

During the summer of 1778 Washington, with headquarters at West Point, held the Hudson firmly in his grasp. Clinton succeeded in taking possession of Verplanck's Point and Stony Point; but Wayne recaptured Stony Point, taking it by storm in one of the most brilliant exploits of the war. The British made various attempts in Connecticut and Rhode Island, but without important success. While these events were happening in the North, the British changed their plan of warfare by transferring the field of activity to the South. This movement was undertaken in the hope of drawing Washington from his strongholds on the Hudson, but the great commander saw that the separation of New England from the rest of the country would be far more disastrous to the cause than the loss of the Southern States. He therefore refused to move. Georgia and South Carolina, consequently, soon fell into British hands. Gen. Gates, who, in opposition to Washington's advice, had been given command in the South by Congress, was overwhelmingly defeated at Camden by Cornwallis.

These untoward events and the lack of any great aggressive movement on the part of Washington in the North, caused widespread discontent. Washington saw that everything depended upon the possibility of keeping up a large army and being ready to move whenever an opportunity should offer, but the difficulties in the way were almost infinite. Congress had no power to enforce levies upon the States, and few of the States were in condition to enforce levies themselves. The pay of the soldiers was far in arrears, and a mutinous spirit became widely prevalent. There was a revolt among the soldiers in Connecticut, which was quelled with great difficulty, and one in Pennsylvania, which was reduced to order only after two of the ringleaders had been hanged. The most serious cause of discontent was the state of the currency. When a bushel of corn cost $150 and a suit of clothes more than $2,000 it is not strange that the elements of discontent seemed about to get control of everything. It is hard to see how anything but the energy and the tact of Washington, as shown in the letters which he sent to all parts of the country, could have kept the cause from complete dissolution. Moreover, it was during this period that the treason of Arnold attempted to turn over West Point to the enemy.

To aggravate all these sources of embarrassment the assistance promised and undertaken by the French proved up to the end of 1780 to have been almost altogether worthless. D'Estaing had been just too late to cut off Lord Howe in the Delaware, and then too late to relieve Newport, and was obliged to go to Boston for repairs, without having struck a blow. The comments and complaints of Americans were so severe that the sensitive French admiral seemed on the point of sailing away in disgust. Washington saw that any serious alienation would be fraught with the greatest disaster. The infinite resources of his tact were never more severely tried. He not only rebuked the officers who had criticised the French, and in every possible way soothed public opinion, but he wrote to d'Estaing one of the most remarkable of all his letters. Deploring the differences that had arisen, and appealing to the loftiest considerations of honor, he wrote: "It is in the trying circumstances to

which your excellency has been exposed that the virtues of a great mind are displayed in their brightest luster, and that a general's character is better known than in the moment of victory. The adverse elements that robbed you of your prize can never deprive you of the glory due you." It was by such diplomacy that the French were held to their alliance until the final opportunity for joint action in 1781.

The Yorktown Campaign.—After the overwhelming defeat of Gates at Camden, Congress yielded to the advice of Washington and placed Greene at the head of the armies in the South. A succession of victories ensued. Morgan defeated Tarleton at the Cowpens Jan. 17, 1781; and, Mar. 15, Greene, after having led Cornwallis across North Carolina, dealt him so severe a blow at Guilford that the British withdrew into Virginia. This was what Washington had desired. He now began active movements about New York to prevent Clinton from sending re-enforcements, at the same time putting himself in communication with de Grasse, who had just arrived at Newport in command of the French fleet. De Grasse then moved to the Chesapeake to prevent the co-operation of the British fleet with Cornwallis. Washington gradually concentrated his forces about New York, as though meditating an attack on Clinton. When he learned that de Grasse had reached the Chesapeake, he directed La Fayette, then in Virginia, to prevent Cornwallis at all hazards from moving south. Aug. 17 he wrote de Grasse, giving him all necessary information as to his own plans. Leaving Heath with a sufficient force to protect the Hudson, and keeping up an active movement at the front to persuade Clinton that an attack on New York was contemplated, he threw the major part of his army across the Hudson on Aug. 23 and 24, and at once began the march south. So skillfully was the manœuver carried forward that it was not till Sept. 2, when Washington had reached Philadelphia, that Clinton learned the nature of the movement. When the forces of Washington, after having united with those of de Rochambeau and La Fayette, closed in around Cornwallis, the British were confronted with a force of about 16,000 men, while escape was prevented by the French fleet in the rear. Cornwallis was soon obliged to abandon his outer works and withdraw into the town. A siege was at once begun. As soon as the batteries had effected a breach Washington ordered an assault. The forces were led by Alexander Hamilton and the redoubt was taken in ten minutes. Cornwallis soon saw that he must either surrender his army or submit to a useless slaughter. He chose to lay down his arms. On Oct. 19 he delivered over as prisoners of war his entire force of about 8,000 men.

Although the treaty of peace was not signed until Sept. 3, 1783, the surrender at Yorktown was virtually the end of the war. During the intervening period, however, Washington deemed it essential to security that the army should be kept up to its full strength, a result which, in view of the state of the currency and the universal arrears of pay, was accomplished with almost infinite difficulty. The dissatisfaction with the slowness of Congress was so general that a mutinous spirit seemed to be almost universal. The weakness of government was very keenly felt, and in May, 1782, the party of reform presented an address to Washington, recognizing him as the proper savior of society and hinting that it would be acceptable to the army if he would assume the headship of affairs. This unquestionably meant the assumption of a crown, and was so understood by Washington. In reply he said: "Be assured, sir, no occurrence in the course of the war has given me more painful sensations than your information of there being such ideas existing in the army as you have expressed, and which I must view with abhorrence and reprehend with severity. I am much at a loss to conceive what part of my conduct could have given encouragement to an address which seems to me big with the greatest mischiefs that can befall my country." Then, after assuring the writer of his great interest in the welfare of the army, he closed by saying: "Let me conjure you, then, if you have any regard for the country, concern for yourself or posterity, or respect for me, to banish these thoughts from your mind, and never communicate, as from yourself or any one else, a sentiment of the like nature." The severity of these utterances checked the movement at once, and it was never again revived; but the full significance of Washington's attitude can not be fully understood without remembering that the notion of kingly government was still familiar to everybody, and that as yet it contained very little that was repulsive.

On Nov. 25 the British army departed from New York and Washington marched in and took possession. On Dec. 4 he bade farewell to his officers, and at once took his departure for Annapolis, Md. Here, on the 23d, he surrendered his commission to Congress in a brief address of such dignity and solemnity that many of the members were moved to tears.

Under the Confederation.—During the critical period extending from 1783 to 1787 Washington, though living in private life, was a keen observer of public affairs. When it became obvious that the Government under the Articles of Confederation was too weak longer to continue, it was inevitable that the people should with united voice call for the sway and the stay of his strong hand. He was chosen to the constitutional convention, and when the delegates came together for their difficult task no one thought of any other for a presiding officer. This is not the place to describe the work of that remarkable body; but it should be said that its great achievements were very largely due to the steadiness with which Washington kept the interests of all parts of the country in view, and the tact with which he conducted the work of reconciling conflicting interests. It is difficult to see how any one can study the proceedings of that convention without perceiving that the outcome was as much the result of a spirit of mutual concession as of political wisdom. It is not too much to say that but for the pervasive influence of that spirit, chiefly engendered and encouraged by Washington, the delegates never would have agreed upon a constitution to be applied to all sections of the country. The Constitution was adopted by the convention Sept. 17, 1787, and, after it had been duly ratified by the several States, Washington was unanimously elected, and on Apr. 30, 1789, was inaugurated the first President of the U. S.

In the Presidency.—In the organization of the new Government Washington desired to accomplish the impossible task of uniting all conflicting political interests and ideas. His dominant purpose was to enlist the democratic notions of Jefferson as well as the federal sympathies of Hamilton and their followers into a hearty and strong support of the Government during the important period of its organization. To this end Jefferson and Hamilton were both called into the cabinet. Washington succeeded in keeping them from unseemly hostilities, but their fundamental ideas were so opposed to each other that complete political harmony was impossible. Washington himself was never publicly regarded as a strong partisan, but it is now easy to see from his letters that his feelings were strongly in sympathy with the general ideas of Hamilton. For the relief of the general financial distresses of the country Hamilton devised a comprehensive scheme consisting of three somewhat distinct parts: 1, the assumption and speedy payment by the Government of all the debts incurred under the Articles of Confederation; 2, the assumption of all the State debts incurred in the prosecution of the war; and 3, the provision of a discriminating tariff on imported goods for the purpose of raising the revenue necessary to accomplish these results. Washington heartily supported all of these measures, and they were adopted very largely through his influence. See UNITED STATES (*History*).

Another important question in regard to which the parties were sharply divided was the attitude of France toward the country during the French Revolution. When Citizen Genet, the French minister, ventured to presume upon the former relations of the governments as a justification for unwarrantable exactions, he was severely rebuked by Washington; but it soon became evident that he had the hearty sympathy of the Anti-Federalists. The subject was complicated by the fact that Great Britain was now at war with France and that the terms of the treaty which ended the Revolutionary war had not yet all been fulfilled. That treaty required the British to evacuate Detroit and the other Western posts without unnecessary delay, but as yet the posts had not been turned over to the U. S. Two important reasons had contributed to this delay. Owing partly to the poverty of the country and doubtless partly to the prevailing ill will left by the war, the British found the Americans slow in the liquidation of their old debts. When it was ascertained, moreover, that Genet was arousing public opinion and even recruiting privateers in the U. S. against the British, a vigorous course was called for. Jefferson was long opposed to definite action, but Washington insisted upon having a letter sent demanding his recall. Though Genet did not think it prudent to return to France, a successor soon arrived, and public opinion was somewhat allayed. The

Anti-Federalists, however, who were in more or less active sympathy with the Revolutionists in France, found in the incident abundant reason for opposition to the general methods of the Government.

A still further cause of irritation was the Jay treaty. Ever after the close of the war the conduct of the British Government had occasioned bitter complaints on the part of the President and people of the U. S. The search of American vessels for British seamen, the impressment of Americans into the British service, the closing of West Indian ports to American trade, the refusal to surrender the Western posts still held by the British, and, above all, the encouragement, if not even the active assistance, of Indians in their continuous warfare along the frontier, indicated unmistakably that unless a radical change could soon be brought about, war would be inevitable. Washington determined to send a special envoy to Great Britain to negotiate a new treaty. His first choice was Hamilton; but the opposition of the Anti-Federalists was so strong that this great leader thought it wise to decline. The President then selected the chief justice, John Jay, whose character and public service entitled him to most favorable consideration. Washington's instructions to Jay were most energetic and explicit. The treaty secured the greater part of the claims which the Americans set forth, though the right of search was still insisted upon by the British Government. When the terms of the treaty came to be known there was an outcry against it throughout the country which has seldom been equaled. Washington himself was not satisfied with the result; but he took the ground at once that it was far better than nothing, and was as good as could be had. Notwithstanding all the uproar throughout the country, the President and the Senate ratified the treaty, and history has amply justified their action.

As Washington's first term of office drew to a close it became apparent that his re-election was desired by both parties. He was the natural leader and supporter of the Federalists, and Jefferson probably saw that his own party was unformed and not in condition to carry on a successful contest. Washington, therefore, was unanimously re-elected, an evidence of public favor which gave him great satisfaction, and enabled him to keep his party together during the formative period of the Government. The most serious questions that arose, not only during his second term but also during the presidency of John Adams, were those relating to foreign affairs. The most intense feelings prevailed in regard to the progress and influence of the French Revolution. Jefferson and his followers looked on the Revolution with not a little favor, and were strenuously opposed to any action of the Government that was not of the most friendly nature. Washington, on the contrary, regarded the course of the Directory with abhorrence, and this feeling was shared by Hamilton and the Federalists generally. At one time Washington wrote to Hamilton: "The conduct of France toward this country is, according to my ideas of it, outrageous beyond conception, not to be warranted by her treaty with us, by the law of nations, by any principle of justice, or even by a regard to decent appearances."

In Retirement.—The treatment of Pinckney, Marshall, and Gerry, whom President Adams sent out as special envoys to negotiate a treaty, as revealed in the famous X, Y, Z letters, roused a storm of indignation throughout the country. A cry for war went up from every quarter. The whole country turned to Washington as the commander of the national forces. Adams persuaded him to accept the appointment of lieutenant-general, on condition that he should not be called into active service except in case of actual hostilities. Washington determined, however, to do his work with characteristic thoroughness, and make all necessary preparations for war. When it was decided to appoint three major-generals, the ranking officer of whom was to be inspector and virtual commander-in-chief, except in case of actual hostilities, Washington proposed the names of Hamilton, Pinckney, and Knox. The order was unquestionably in accordance with the organizing abilities of the several men, but Knox had been the ranking officer in the Revolutionary war, and had rendered distinguished service. This fact, coupled with the antipathy or jealousy of Adams for Hamilton, led Adams to reverse the order of the names suggested by Washington. Washington expressed to the President his earnest disapproval, and Adams promptly receded from his determination. But the incident became known, and was the beginning of that strife in the Federal party which speedily resulted in its overthrow. The army was thoroughly organized, and the Alien and Sedition Acts were passed, but every movement seemed to intensify the bitterness of the Anti-Federalists and to widen the breach between the two branches of the Federalists themselves.

Before Adams's administration was far advanced it became evident that the Jay treaty, the funding of the national and State debts, the attitude of the Government toward France and Great Britain, and the reorganization of the army had together built up a mass of opposition which was likely to prove fatal at the next election. Earnest appeals were made to Washington to consent to become a candidate in order to save his party, but he declined, believing that in the coming contest over matters of principle the personality of the candidates would count for nothing. Though partisanship at this period often showed an intensity which happily in later years has seldom disfigured political life in the U. S., Washington was followed into his retirement at Mount Vernon with universal veneration and gratitude. His letters, even up to the very week of his death, show that, while he never presumed to interfere with the course of those upon whom official responsibility now rested, he never ceased to entertain a very active interest in all the political affairs of the country. He died on Dec. 14, 1799, in the sixty-eighth year of his age, in consequence of an acute inflammation of the throat caused by exposure while making the round of his estate in a severe storm.

General Estimate.—Washington, more perfectly than any other man in all history, is entitled to be known as the Father of his Country. Though at first he was not in favor of independence, he was among the earliest to perceive the necessity of it, and when once that necessity was recognized he never for a moment wavered from his determined purpose. He entered upon the war with a sedate consciousness of the magnitude of the undertaking; but in all his vast correspondence there is not a phrase to indicate that even in the darkest days of 1778 and 1779 he ever for a moment was in doubt of ultimate success. Nor was his a blind faith that can not see obstacles in their true light. He had an unhesitating belief that, if the colonies would continue to keep up an army he could, by choosing judiciously where to fight and when to retire, bring the war to a triumphant close. He fought invariably on his own terms. He was continually surprising the enemy, but he was never surprised himself. He was not always victorious, but even when repulsed and beaten he always brought off his force intact, and after a night's rest was ready to fight again. He was instantaneous in his ability to detect a mistake or an oversight in his enemy. The movements which led to the battles of Trenton and Princeton were recognized by Frederick the Great as among the most daring and brilliant of the century, and they have since been aptly compared with what Wellington regarded as the most brilliant of all Napoleon's exploits, the campaign after the battle of Leipzig. His keen foresight, his quick perceptions, his fertile ingenuity, and his impetuous courage were ever governed by an unfailing self-control and a consummate ability to detect and to trace the dividing-line between the practicable and the impossible, and it is difficult to study the campaigns in detail without arriving at the conviction that nothing but the smallness of the resources he had to deal with has prevented him from being universally recognized as one of the greatest of military commanders.

In the domain of statesmanship he was not less successful. He was one of the earliest to detect the fundamental defects in the Government established during the war; but he was wise enough to see the magnitude of the difficulties that stood in the way of bringing the North and the South, as well as the large and the small States, into harmonious agreement. When the weaknesses of the Confederation came to be universally recognized, the delegates to the convention, as well as the people at large, instinctively turned to him for guidance. Their reliance was not misplaced; for the Constitution, in all fundamental characteristics as it now stands, could hardly have been adopted but for his harmonizing and conciliating wisdom. During his office as President it was not only the unfailing strength and discretion of his foreign policy that, notwithstanding the violence of popular outcries, secured the rights of the country from Great Britain and France without war, but it was also his remarkable skill and firmness in the selection and support of heads of departments that brought the chaos of the Confederation little by little into the firm consistency of a united and strong Federal Government.

Finally, he was thoroughly American in the best sense of the term. Sober history can never adopt that line of America's greatest poet which characterizes Lincoln as the first great American. It was Washington that was the first to rise above the colonial spirit, and to reach the broad conception of a grand nationality. To Congress, which seemed inclined to commission every European adventurer that was recommended by Silas Deane, he wrote that the war must be fought and the victories won by Americans, if at all. In the same spirit he wrote to Patrick Henry in 1795: "My ardent desire is to keep the United States free from political connection with every other country, to see them independent of all, and under the influence of none. In a word," continued he, "I want an *American* character, that the powers of Europe may be convinced that we act for *ourselves*, and not for others." In his farewell address he adjured the country with great solemnity to avoid foreign entanglements and alliances; and in his will, after leaving a portion of his property for the founding of a national university at the capital, he used these words in explanation of his purpose: "It has always been a source of regret with me to see the youth of these United States sent to foreign countries for the purposes of education, often before their minds are formed or they have imbibed any adequate ideas of the happiness of their own; contracting too frequently not only habits of dissipation and extravagance, but principles unfriendly to republican government, and to the true and genuine liberties of mankind, which thereafter are rarely overcome. For these reasons it has been my ardent wish to see a plan devised on a liberal scale, which would have a tendency to spread systematic ideas through all parts of this rising empire, thereby to do away with local attachments and State prejudices, as far as the nature of things would or indeed ought to admit, from our national councils." From such expressions as these, scattered throughout his writings, it is evident that Washington was not only a great soldier and a great statesman, but a great American as well.

AUTHORITIES.—The most valuable of all sources of information is Ford's edition of the *Writings of Washington*. The old edition by Sparks was very injudiciously edited, and failed to contain many papers of importance that have since come to light. Of the many works on the life of Washington, those of Lodge and Laboulaye may be regarded as the most important. Those by Marshall and Irving, while valuable, were not written in the light of recent information. Of the general histories of the period, Fiske's *The American Revolution*, and the same author's *The Critical Period of American History, 1783–1789*, are the most modern and are written in the light of the most recent research. Bancroft's history for the period from 1765 to 1789 is a classic which still retains its importance. C. K. ADAMS.

Washington and Jefferson College: an institution of learning in Washington, Pa.; the result of the union of Washington College and Jefferson College, located respectively at Washington and Canonsburg, two villages 7 miles apart in Washington co., Pa. The former was chartered as a college in 1806, the latter in 1802. Throughout nearly their whole history efforts and plans for uniting them were proposed. With the cost of living increased by the civil war, their endowments, whose incomes furnished but a bare support before, became thereafter altogether inadequate. Under these circumstances the trustees of both institutions accepted the offer of Rev. Charles C. Beatty, D. D., LL. D., of Steubenville, O., of $50,000 if they would unite, and in 1865 the enabling act passed the Legislature. By that union the preparatory department, scientific department, and the freshman class of the classical department were located at Washington, the sophomore, junior, and senior classes at Canonsburg. This arrangement proved undesirable, and application was made to the Legislature for leave to consolidate the whole institution at one place; this request was granted, and the trustees under that authority located the whole at Washington, Pa., in 1869. The first president was Rev. Jonathan Edwards, D. D., LL. D., who was succeeded in 1870 by Rev. George P. Hays, D. D., who, resigning in 1881, was succeeded by Rev. James D. Moffat, D. D. Buildings were erected in 1875 at a cost of about $80,000, and a gymnasium in 1892 at a cost of $40,000. The principal additions to the endowment have been $40,000 by Dr. Francis J. Le Moyne, to found the chairs of agriculture and applied mathematics, and $60,000 by Rev. C. C. Beatty, D. D., to endow the chairs of Greek and Latin. The productive funds of the college amount to about $270,000. In 1900 there were 20 professors and instructors, 350 students, and 16,000 volumes in the library. J. D. MOFFAT.

Washington and Lee University: an institution of learning at Lexington, Va. The settlers of the Great Valley of Virginia in 1749 established near the site of Greenville, Augusta co., a mathematical and classical school which was called Augusta Academy until the war of the Revolution. Its name was then changed to Liberty Hall Academy, and in 1780 the institution was removed to Lexington. Its charter was procured in 1782. It received from Gen. Washington, in 1796, 100 shares of stock in the James River Canal Company, which was commuted by the Legislature to an interest-bearing fund of $50,000, and the name was changed to Washington College. It received in 1803 a fund of $25,000 from the Society of the Cincinnati, and in 1826 a bequest of $40,000 from John Robinson. Its endowment has been increased to $625,000 by later gifts. On the death of Gen. Robert E. Lee in 1870 the name was changed to its present form. The course of study is divided into elective schools, including classic and literary studies, the applied sciences, engineering, and law. Scholarships are conferred upon students for the ministry, sons of clergymen, upon the students ranking first in several academies and high schools, and upon students ranking first in the several departments of the university. Several endowed scholarships and fellowships yield the holders from $300 to $500 each. Degrees are conferred only upon examination in the courses of the several schools. The government is in the hands of a board of trustees, and is more immediately conducted by the president and faculty. Instruction was suspended during the civil war, when the college suffered by the destruction of its scientific apparatus during the occupation of the town by the Union forces, but these losses have been more than counterbalanced by liberal contributions. The institution was reorganized in 1865 under the presidency of Gen. Robert E. Lee. George Washington Custis Lee was the second president, and William L. Wilson was president from 1897 to 1900. It has a library of about 30,000 volumes, and an average of 250 students and 25 instructors.

Washington University: an institution of learning at St. Louis, Mo.; incorporated in 1853. It consists of six higher departments—the undergraduate department, including the college (1859) and the polytechnic school (1870); the Henry Shaw school of botany (1886); the St. Louis law school (1867); the school of fine arts; the St. Louis medical college (1891); and the Missouri dental college (1892). The university also has three secondary schools—the Smith academy (1854); the manual-training school (1879); and Mary institute, for girls (1859). The number of students in all departments in (1900) was 1,939; the number of instructors was 163. The special reference libraries in the several departments include about 15,000 volumes. Fifty perpetual memberships in the Mercantile Library (75,000 vols.) are in the undergraduate department. The real estate of the university is valued at $625,000, and its total endowment $1,250,000. WINFIELD S. CHAPLIN.

Washington, University of: a State institution located at Seattle, Washington; the culmination of the State's system of public schools. In 1854 Congress granted two townships of land to the Territory of Washington for the establishment of a university. The school was opened in the town of Seattle in 1862, and in 1895 was transferred to a fine and picturesque campus of 350 acres between Lakes Union and Washington, 2 or 3 miles from the earlier site. In its new location it has been provided with buildings suitable for the accommodation of 800 students. In 1893 the State gave the university an endowment of 100,000 acres of land. The fees are very low. In 1900 the university had 40 instructors, 650 pupils, a library of 15,000 volumes, a good museum, and 20 departments of instruction. It has a school of pharmacy and a mining-school, and schools of law and medicine are contemplated. M. W. H.

Wash'ita River (frequently spelled **Ouachita**): a stream which rises by its Brushy Fork in Polk co., Ark., and flows first E. and then S., crossing the Louisiana State line, and finally discharges its waters into Red river. That part of Washita river between Tensas and Red rivers is sometimes called Black river. It is navigable by steamboats throughout the year to Camden, Ark., and for two-thirds of the year to Arkadelphia, Ark. It is 600 miles long, and flows through a rich corn and cotton region. Its navigation is extensive and important.—Another WASHITA, called also

the False Washita, traverses the Indian Territory between the South Fork of the Canadian and Red rivers, and falls into the latter stream at Washita Bend, above Preston, Tex. See Red River. Revised by I. C. Russell.

Washo'an Indians: a linguistic family of North American Indians represented by a single small tribe, the Washo, in Western Nevada. The name Washo is a corruption of *Wol-osh'u*, signifying red man or Indian. When first known to the whites the Washo occupied the Truckee river as far down as the meadows, though the possession of the latter was in dispute, the Paviotso, a Shoshonean tribe, also claiming them. They also held Carson river down to the first large cañon below Carson City, and occupied the borders of Lake Tahoe, as well as Sierra, and other valleys northward to the first range south of Honey Lake, California, the mountains being resorted to only in summer. Of late years they have been confined to the country from Reno, on the Central Pacific Railroad, to a short distance south of Carson City. They have adopted a parasitic mode of life, being almost entirely dependent upon the towns and ranches. Their language seems to be quite distinct from any other known, though a few resemblances to California dialects, especially the Miwok, have been found. In physique and general appearance they resemble the California Indians rather than the Shoshonean tribes to the eastward of their habitat. There are some evidences that they once were established in the valleys farther to the east than those they occupied when found by the whites. In 1859 the Washo were said to number about 600. The present population is about 200. See U. S. Indian Affairs *Reports* for 1859, 1861, 1866, 1869, 1870; also Indians of North America. J. W. Powell.

Wasp [M. Eng. *waspe* < O. Eng. *wæspe*, *wæps* : O. H. Germ. *wefsa* > Mod. Germ. *wespe*; cf. Lith. *wapsa*, gadfly : Lat. *vespa*, wasp, and Fr. *guêpe*, from M. H. Germ. *wespe*]: any one of a large number of hymenopterous insects (see Entomology) which are all essentially similar in the possession of a sting of no mean capacity at the end of the abdomen of the female. They have strong biting jaws, and the abdomen is either joined to the thorax by its whole breadth or by a slender pedicel. They may be separated from all other stinging *Hymenoptera* (*Aculeata*) by the absence of a kink or "knot" in the pedicel of the abdomen (which occurs in the ants), and by the cylindrical first joint of the hind foot or tarsus (which in the bees is expanded into a "basket" for carrying pollen). There are two well-marked groups of wasps, each containing many species: (1) The digger wasps, in which the wings are not folded when at rest, and (2) the true wasps, in which they are folded. In the first, of which there are several families, the female usually constructs nests for the young by excavating holes in the earth or in wood, and in them she lays her eggs. The diggers are all solitary in habit—i. e. each female works by herself in the nest-making. In the nest she stores up food in the shape of insects, which she paralyzes, but does not kill, with her sting. On these the larva feeds until ready to go through its transformations. Each species has its peculiar habits in this respect, some storing the nests with spiders,

Common wasp (*Vespa vulgaris*).

Nest of paper-making wasp.

others with beetles, others still with caterpillars. Comparatively little is known of the habits of the American species in these respects. To the digger wasps also belong the mud-daubers, which make nests of clay in barns, garrets, etc. Among the true wasps are some with all the habits of the diggers, boring in wood or earth, or making mud nests, each female working alone in this respect; while others are social in habits, and in the colonies of these forms we find, as in the ants and bees, males, females, and workers, the males alone being stingless. Most of the work is done by the workers, who build the nests either attached to the eaves of buildings or to trees, or concealed in the ground. The best known of the true wasps are the "yellow-jackets" or hornets, which construct the well-known large paper nests. The paper is obtained by tearing up weathered wood and mixing it with saliva, the whole forming a veritable wood-pulp paper. The cells are arranged in combs much as in the case of the honey-bee. No food is stored up, however, and the adults feed the growing young on masticated insects which they have captured. Males and workers die in the autumn, while the females pass through the winter to form new colonies in the spring.

Literature.—For species, etc., see papers by Packard (*Proc. Entomol. Soc.* (vol. vi., Philadelphia, 1866); Cresson, (*Transact. Entom. Soc.*, Philadelphia, 1882–83, 1887); Sausson, 1853–75. For habits, see Lubbock's *Ants, Bees, and Wasps* (New York, 1882). J. S. Kingsley.

Waste: any injury to real property committed by a tenant for life or for years to the prejudice of the reversioner or remainderman. This injury was punishable at common law by *Writ of Waste*, instituted "by him that had the immediate estate of inheritance," or it could, in a proper case, be restrained by an action in Chancery. At the present time the proceeding in Chancery, extended so as to cover an award of damages already sustained by the owner of the inheritance, has generally completely superseded the common-law remedy, the technical action of waste having been abolished in England and most of the U. S. In some of the States a statutory action at law has been substituted for the old writ of waste (see, e. g., the *New York Code of Civil Procedure*, §§ 1651–1659), without, however, derogating from the jurisdiction of the equity tribunals.

The doctrine of waste was a necessary corollary of the common-law doctrine of estates in land. (See the articles Estate and Property.) It will be remembered that there was at common law no such thing as an absolute ownership of lands by any subject, but only an estate, or interest, for a definite or indefinite period of time. So far as the term owner was applicable to any holder, or tenant, of lands, it belonged to a tenant for life as well as to a tenant in fee simple, and so long as the present owner (the particular tenant) was in possession, the future owner (reversioner or remainderman) was a stranger to the land, and could maintain no action at law or in equity with reference to it. He was, therefore, in theory at least, wholly without protection against the wasteful use of the tenement by the particular tenant. Just as a tenant in fee simple may devastate his property, leaving it to descend in a wasted and ruinous condition to his heir, so might a tenant for life or for years, upon the expiration of his estate, transmit the land to his successor denuded of everything that rendered it a valuable acquisition.

It was to remedy this anomalous consequence of the common-law theory of property in land that the doctrine of waste was devised. It was in its origin apparently a creation of the courts of common law, as a limitation on certain classes of life estates, which were themselves created by that law. As the estates known by the description of guardianship in chivalry, tenancy by the courtesy, and tenancy in dower, arose without the act or consent of the preceding owner of the fee, it was deemed just that the law which created them should also protect the heir against the abuse or destruction of the inheritance by such intervening tenant. The doctrine of waste as thus employed was by the Statute of Marlborough (52 Henry III., A. D. 1267) extended to tenants for years. This statute was followed in 6 Edw. I. (1278) by the Statute of Gloucester, which gave a writ of waste against any tenant for life or for years, fixed the damages at "thrice so much as the waste shall be taxed at," and punished the wasting tenant by forfeiture of his estate. Starting from this legislation the doctrine of waste was elaborated by the courts into a body of minute and, sometimes, technical rules. Waste was of two kinds—voluntary and permissive. Voluntary waste was such as was caused by the active misconduct of the tenant; permissive, such as resulted from his passive negligence. Cutting down timber trees, tearing down or altering buildings, opening new mines and quarries, and the like, are examples of the for-

mer; while merely suffering buildings and fences to become dilapidated or out of repair, or orchards to become decayed, or fields to become overrun with weeds and briers from lack of proper cultivation, are illustrations of the latter. But it was at common law as unequivocal an act of waste to build a new house or to alter and improve an old one, as to destroy a portion of the inheritance. To redeem waste land, or to convert woodland or meadow into arable land, or *vice versa*, were equally wasteful acts. The destruction of buildings by accidental fire or by the act of an incendiary was waste, but if a house "fall down by tempest, or be burned by lightning, or prostrated by enemies [i. e. the public enemy], or the like, without a default of the tenant, or was ruinous at his coming in and fall down," it is no waste.

The law of waste remains at the present time substantially as above set forth, although it has in its more technical applications been considerably modified, both in England and in the U. S. Thus it is generally provided by statute that a tenant for years shall not be compelled to suffer the consequences of a destruction of the premises by fire for which he was in no wise to blame, and in the U. S. a tenant may generally make such changes in the use and character of farming land as are deemed to be a proper and husbandlike treatment of the land in question, or, if the waste alleged is an unauthorized improvement of the premises, he may justify by showing that he has thereby actually and materially benefited the inheritance. The jurisdiction of the common-law tribunals has from a very early period been supplemented by equity in restraining and punishing acts of vandalism by a tenant which did not come within the technical description of waste. Of this character was the destruction of shade and ornamental trees, which were not timber trees, and the excessive and wasteful use of his privileges by a tenant who held his lands "without impeachment of waste." The term timber was ordinarily confined to the three varieties of trees usually employed for building purposes—namely, oak, ash, and elm—although in some parts of England, where proper timber was scarce, beeches and sometimes other trees were included under that designation.

It is to the doctrine of permissive waste as thus developed at common law that we owe the familiar rule of law which throws upon the tenant the burden of making all ordinary repairs to the premises occupied by him. Strictly speaking, the tenant can not be called upon to make repairs, nor is he liable in damages for his failure to do so. But as the deterioration or destruction of the premises subjects him to the harsh consequences of an action for waste, and as his only defense to such an action is to show that he has repaired the waste, he chooses the lesser hardship in keeping the premises in repair. The liability for waste, which was at common law confined to tenants for life and for years, has in recent years been extended by statute or judicial legislation to cover the acts of mortgagors and mortgagees in possession, of tenants in common, and of the vendor and vendee, respectively, under a contract for the sale of land. It is a confusion of the subject to refer the similar liability of a tenant at will (known as his liability for voluntary waste), as well as that of a tenant at sufferance, and of persons unlawfully in possession of lands, to the law of waste, instead of trespass, where they belong. Devastation by trustees, executors, and judgment debtors, as well as by owners of the fee whose estates are subject to executory limitations (see TENURE), while not coming within the description of waste, will yet be enjoined as such by the courts of equity.

See LANDLORD AND TENANT. Consult also the *Commentaries* of Blackstone and Kent; McAdam on *Landlord and Tenant*; Taylor on *Landlord and Tenant*: Williams on *Real Property*; and the *American and English Encyclopædia of Law*, title *Waste*. GEORGE W. KIRCHWEY.

Watch [deriv. of *watch*, hour of the night, period of time occupied by soldiers, etc., on duty < O. Eng. *wæcce*, watching, watch, deriv. of *wacan*, wake]: a timepiece designed to be worn or carried on the person, as distinguished from a clock, which is a stationary timepiece. (See CLOCKS.) While to some extent the principles of the mechanism of clocks and watches are identical, yet there are radical differences in construction. It is evident that the employment of weights and pendulums is applicable only to stationary timepieces; but the equivalent of the weight has been found in the coiled spring, and the vibrating balance-wheel has been found to answer the purpose of the vibrating pendulum, when supplemented by the action of the hair-spring, which, like the force of gravity in the case of the pendulum, is constantly striving to bring the moving balance to a state of rest.

Description of a Watch.—A complete watch is made up of two parts—the case and the movement. The latter consists principally of a train of gear-wheels and pinions, mounted between two metallic plates, commonly of brass or nickel alloy, in which the arbors of the wheels and pinions are journaled or pivoted. For symmetry of form and convenience in construction, as well as in practical use, this train of gearing is arranged as compactly as possible, and

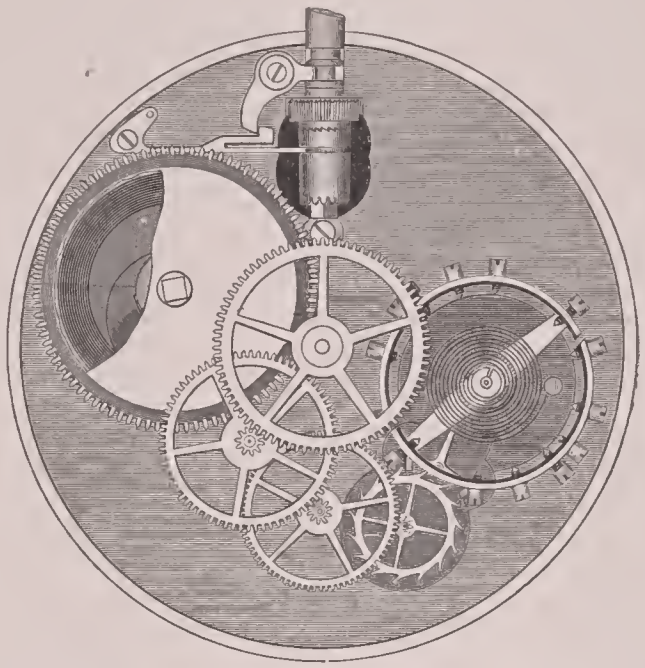


FIG. 1.—Arrangement of time-train of a ¾-plate, open-face, pendant-setting watch.

somewhat circular in form. (See Fig. 1.) Except for these reasons, however, the several members of the train could be located in a straight line, as shown in Fig. 2. At the right-hand extremity of this train is a large box-like wheel, containing the coiled mainspring (a ribbon of carefully tempered steel, from about 12 to 24 inches long), which serves as a medium for storing the physical energy or force exerted by the individual who winds the watch. In the ordinary form of construction the inner end of this spring is attached to the barrel arbor, while the outer end is connected to the barrel itself; the spring is wound up by turning the barrel arbor, and is prevented from immediately unwinding by a ratchet on the arbor, the teeth of which are engaged by a pawl or click attached to some stationary portion of the watch. In its efforts to relieve itself from the stress caused by the winding process, the action of the spring is to turn the inclosing barrel, the gear-teeth of which mesh into the center pinion, the next member of the train. In modern watches, as ordinarily constructed, this second member is located

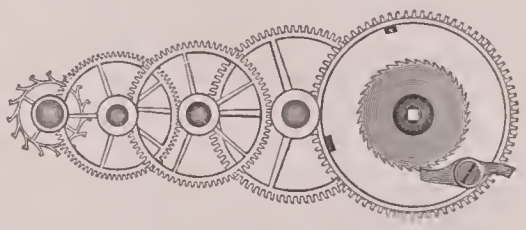


FIG. 2.—Watch time-train arranged in a straight line: From right to left in order, the members are (1) the barrel; (2) center wheel and pinion; (3) third wheel and pinion; (4) fourth wheel and pinion; and (5) escape-wheel and pinion.

in the center of the circular watch-plates, and upon its axis is fixed the minute-hand. Fixed to the staff or arbor of the center pinion is a wheel, technically known as the center wheel, which meshes into the third member of the train, called the third pinion. To this pinion is also affixed a wheel called the third wheel, which in like manner meshes into and gives motion to a fourth pinion and wheel. The fourth member of the train revolves at sixty times the speed of the center wheel and carries the second-hand. This increase of speed is obtained by the interposition of the third wheel and pinion, which also secures another desirable end—viz., that of making the direction of the two members identical.

Although the minute-hand is mounted upon the axis of the second member of the train, it is not fixed directly to the staff, but upon the upper end of the cannon-pinion, so called from its having a long body, or hub, slightly suggestive of a cannon; and whereas the pinions in the time-train proper are integral with the staves or arbors, which are solid and pivoted at their ends, the cannon-pinion has an axial hole running its entire length, corresponding in size with the diameter of the projecting end of the center staff, upon which it is placed, being held by a sufficient frictional contact to carry the pinion and hand, and still allow of movement upon the staff, for the purpose of setting the hands. On key-winding watches of "full plate" model, the upper end of this cannon-pinion is made square, and of the same size as the square end of the mainspring or barrel arbor, so that the same key may be used for both setting the hands and winding the mainspring. In modern watches, commonly known as stem-winding watches, the hand-setting is performed by mechanism which may be thrown in gear with the stem at will, the same operation throwing the winding mechanism out of gear.

It remains to consider the provision for the mounting and movement of the hour-hand. The teeth of the cannon-pinion are made to engage with the teeth of a little wheel which fits loosely upon a stationary stud projecting from the lower or pillar plate of the watch. The proportion in the number of teeth of this wheel and the cannon-pinion is ordinarily three to one.

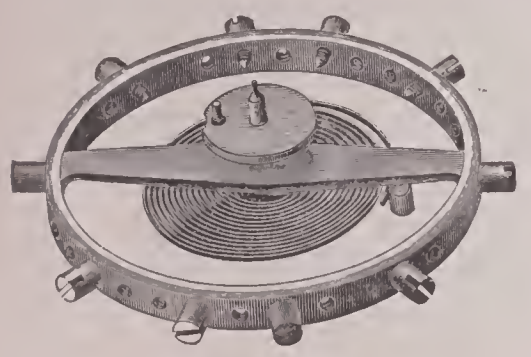


Fig. 3.

Rigidly affixed to this wheel is a pinion, commonly called the minute-pinion, the wheel being designated as the minute-wheel. Upon the body or hub of the cannon-pinion is loosely fitted a wheel also having a projecting hub, upon the upper end of which is placed the hour-hand. The teeth of this wheel are made to engage the teeth of the minute-pinion before mentioned, their relative proportion being that of four to one, so that through the interposition of the minute wheel and pinion it will require twelve revolutions of the cannon-pinion, carrying the minute-hand, to produce one revolution of the hour-wheel, which carries the hour-hand.

The Escapement.—With only the time-train properly mounted, if the mainspring should be wound up, the effect would be to turn the mainspring barrel or wheel in which it is inclosed, which in turn would move the second wheel of the train, and it the third, and so on, each with increasing velocity, so that within perhaps a minute or two the various hands would have traversed their individual circuits as many times as would be required for a complete day. It is evident that no attachment in the nature of a brake which should serve to reduce the speed of the wheel would be practicable, for two reasons—first, it would be impossible to maintain a uniform degree of friction, and, second, because of the constantly diminishing force of the uncoiling spring.

The device employed to secure a correct and uniform speed is called an Escapement (*q. v.*). The form which is now most commonly used, and which is probably, on the whole, the most satisfactory, is known as the *detached-lever* escapement. To the fourth or last pinion of the time-train is attached a wheel meshing into a small pinion known as the escape-pinion, to which is made fast the escape-wheel, in form entirely unlike any of the wheels of the time-train. (See Fig. 4, 5, or 6.) This wheel has fifteen teeth, and of each tooth one side is straight, but not radial, so that these teeth form a series of hooks. It will also be observed that the tops of these teeth are also straight, but not tangential, forming a series of inclines. Pivoted at one side of this wheel is the pallet, a peculiar anchor-like piece, the arms or ends of which are turned inward, but at differing angles. The extremities of these arms (also called pallets) are usually formed of some kind of precious stones, such as garnet, ruby, or sapphire, and are so placed that one or the other of them always slightly projects between some of the teeth of the escape-wheel so as to lock the escape-wheel and prevent its turning, which, of course, makes impossible the movement of the time-train. If, however, the pallet should be rocked back and forth, causing the two extremities to alternate in locking the escape-wheel, one tooth of the latter would be allowed to escape at each oscillation, and therefore with the fifteenth oscillation the escape-wheel would complete one revolution. Evidently if this vibratory motion of the pallet could be continued at a correct and exactly uniform rate, the entire mechanism could be made to operate as desired and the progress of time be accurately indicated. This result is accomplished by means of a balance-wheel, hair-spring, etc.

In Fig. 3 is shown a balance-wheel mounted upon an arbor or staff upon which is also placed a hair-spring. This spring is on the upper side of the balance, while below the balance is fixed a small disk, technically known as the roller, from the lower side of which, near the periphery, projects a small pin formed from a precious stone and called the roller-pin. The pivots of the balance-staff are made exceedingly small and delicately finished, and are journaled in jewels of ruby and sapphire because of their special hardness, and, unlike the pivots of the time-train proper, are provided with end-stones to receive the end thrust which in the other pivots is received by the shoulders of the staffs. The object of this form of mounting is to reduce the running friction of the pivots to the smallest possible amount, and also to make it constant and uniform. The necessity for this extreme delicacy arises from the fact that the initial force given by the mainspring is small, and that only about $\frac{1}{126000}$ of it can be exerted at each oscillation of the balance.

From the pallet there extends back an arm, the extreme end of which has a semicircular hollow curve like the top of a crutch, in the center of which is a narrow slit. The balance-wheel is mounted in relation to this fork and the pallet and escape-wheel, so that their arbors are in a straight line, and so adjusted that when in position of rest the roller-pin above mentioned rests in the little slit in the hollow of the fork, with one of the arms of the pallet resting on the inclined top of one of the teeth of the escape-wheel (Fig. 4). The slight turning of the escape-wheel (in clockwise revolution), however, on account of the transmitted force of the mainspring, causes the pallet to swing to one side, on account of the inclined top of the tooth, and the lever swinging also carries with it the roller-pin, so causing the balance-wheel to turn, thereby creating a stress in the hair-

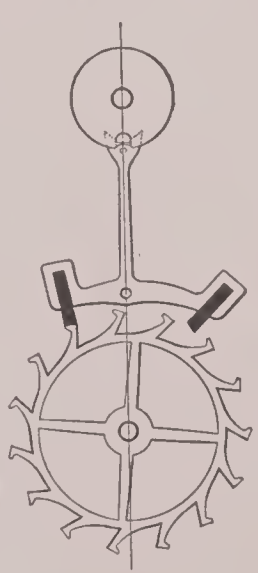


Fig. 4.

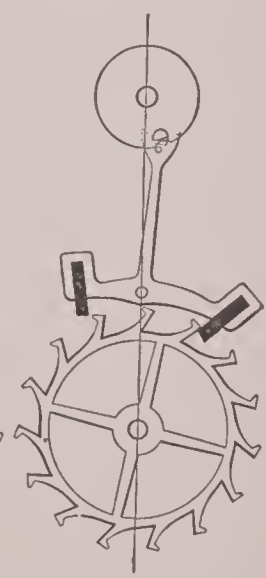


Fig. 5.

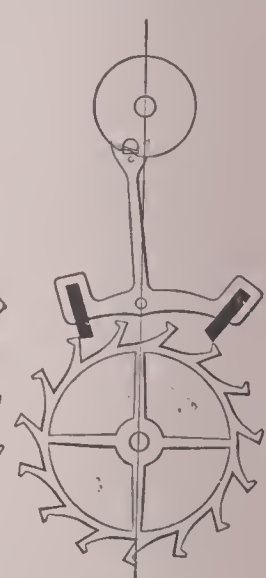


Fig. 6.

spring. The motion of the pallet in this direction substantially ceases as soon as the tooth of the escape-wheel leaves it, but its movement is sufficient to swing the other arm of the pallet directly in front of another tooth of the wheel, and so further movement of the wheel is arrested (Fig. 5). Now the hair-spring asserts itself, and begins to turn the balance back to the point of rest. In so doing the roller-pin is again made to enter the fork, and with sufficient force to swing the lever and pallet in the opposite direction, thereby unlocking the tooth of the escape-wheel, which at once begins to turn, and, as before, the inclined top of the tooth gives an impulse to the swinging pallet (Fig. 6). Each movement of the pallet and fork gives a slightly increased arc of motion to the balance until the proper equilibrium is reached.

It is evident that the strength of the hair-spring and the

weight of the balance must be properly related. This adjustment is exceedingly delicate. In most modern watches the train is arranged so as to require 18,000 vibrations of the balance-wheel per hour, and a loss of only a single vibration each hour would be a loss of a trifle over 33 seconds per week. The balance of the ordinary gentleman's watch travels about 18 miles each twenty-four hours.

The detached-lever escapement was the invention of Thomas Mudge about 1765, although several modifications in form of construction have been made. The form shown in Figs. 4, 5, and 6 shows the impulse action divided between the pallets and the escape-wheel teeth. A favorite form of the wheel with English watchmakers has slender pointed teeth, and the impulse angles are entirely on the pallets. The Germans, on the other hand, make an escapement in which the pallets are simply round pins, and the impulse plane is entirely on the wheel-teeth. In the description of the action of the detached lever no mention was made of one important function of the roller—viz., its use as a safety device. For greater safety double rollers are now used on the better grades of Waltham watches.

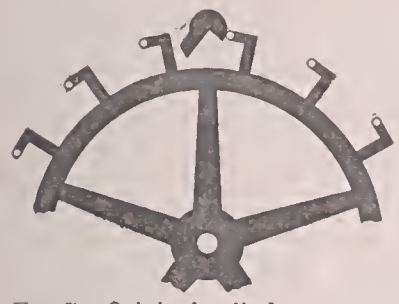


Fig. 7.—Original cylinder escapement.

Although the detached-lever escapement is the simplest and most reliable form, others are in use. The *chronometer escapement*, invented by Pierre Le Roy in 1765, and improved by Earnshaw and Arnold about 1780, is used in ship or box chronometers, and by reason of its peculiar design is well adapted for timepieces which are not subjected to sudden and extreme changes of position. It is, however, sometimes applied to pocket watches of high grade. In the ordinary detached lever we have seen that each tooth of the escape-wheel acts first as a detent, and then to give an impulse to the balance, through the intermediate agency of the pallet and fork and roller-pin, and also that this action takes place at each excursion of the balance. In the chronometer escapement one of the teeth is held by a fixed spring detent, which is lifted by a little arm or dog attached to the balance arbor or staff. At the instant of the lifting of the detent and release of the escape-wheel tooth another tooth of the wheel imparts impulse to the balance through a second and longer arm or dog. This action takes place during the movement of the balance in one direction only. On the return movement of the balance the longer arm or dog passes between the teeth of the wheel, while the shorter arm is allowed to repass the detent by slightly deflecting a delicate spring, which rests upon a rigid seating, so as to resist pressure in the opposite direction. This form of escapement admits of some variety in arrangement and construction of the several parts.

The *duplex escapement* (patented about 1782 by Thomas Tyrer) possesses several features of similarity to the foregoing. It comprises an escape-wheel furnished with two sets of teeth in different planes, one set serving to impart the impulse to the balance direct, while the other set act as detents, to arrest the movement of the time-train during the movement of the balance in one direction, and also during most of its return movement.

A fourth form of escapement (invented by Booth and patented in 1695) is known as the *cylinder escapement*, by reason of the construction of the balance arbor, which is much larger in its body portion than in other forms (Fig. 7). This middle portion is cylindrical in form, one side of it being cut away so that when turned to a certain position one of the peculiarly formed escape-wheel teeth which was resting on the periphery of the cylinder is allowed to escape and move in until it strikes the inner side of the cylinder on the opposite side (in its passage in, the tooth, by means of its inclined top, gives an impulse to the cylinder). The peculiar form of the tooth permits the cylinder partly to encircle it, and on the return movement of the cylinder the tooth passes out, and by means of its inclined top, or face, gives an impulse to the cylinder and balance in a direction opposite to its entering impulse. This form of escapement possesses the merit of compactness, and is therefore used by European makers, especially in small watches, but its nature and plan of operation preclude a high degree of accuracy.

Devices to Lessen Friction.—The facts and conditions which have been described make it evident that the very small amount of power available must be economized, so that the least possible portion of it shall be absorbed in friction. To insure this economy it is needful to have special regard to the construction and care of those portions of the mechanism where friction will be developed, viz., those parts which have a movable contact with each other; these points being the teeth of the wheels and pinions, the various pivots, and the parts of the escapement which slide one upon another. In forming the teeth of the wheels and pinions it is the practice to employ the epicycloidal curve, so that a rolling instead of a sliding contact may be obtained, and great pains are taken to produce a smooth and glossy surface on the pinion-teeth. The attempt is also made to proportion the teeth of the wheels to those of the pinions with which they act, so that no contact shall occur before the line of centers, the object being to avoid side thrust or pressure against the staff pivots.

A further provision for reducing friction in the train, and at the same time for insuring greater durability, consists in the employment of jewels as bearings in which the various pivots revolve. The advantages gained result from the fact that it is possible to produce a smoother surface in a precious stone than can be made in brass or nickel. There is also secured a greater durability, by reason of the fact that particles of dust inevitably find their way into a watch, and, reaching the bearings, become imbedded in a softer metal, remaining to wear or cut away the moving pivots. This alone makes it necessary that watches should be carefully cleaned at intervals not too prolonged.

Adjustment.—Watch movements of the higher grades are subjected to three kinds of adjustment, viz., adjustment to isochronism—to make both long and short arcs of vibration of the balance take place in identically equal intervals of time; adjustment to position—to put the movement in such condition that its time rate shall be constant in whatever position it may be placed, or however often its position may be changed; and adjustment to varying temperature. For the adjustment to position the movement is tested in six positions, viz., dial up, dial down, and 12 up, down, right, and left. The most important adjustment, however, is that for varying temperature. This consists in certain simple manipulations of the balance to put it in such condition that it will automatically compensate for the otherwise disturbing effects of thermal changes. Besides the lengthening of the spring and the enlargement of the balance, in accordance with the law of expansion of metals under the influence of heat, a much greater disturbance is caused by the loss of elasticity in the spring due to the increase of heat. It has been estimated that the loss per day from a change from 32° to 92° F. would be 6 minutes 33 seconds. To neutralize or overcome this difficulty, the best movements are provided with what are called compensation or expansion balances—i. e. balances whose rims are composed of two metals in laminated form—the outer lamina being of an alloy of much higher expansibility than the inner, and so constructed that the thermic changes, which would otherwise greatly modify the speed, are made to provide a means of correction.

Compensating balances are ordinarily formed of steel, to which is carefully fused an encircling band of brass. The ratio of expansion of these two metals is indicated in Fig. 8. At normal temperature the two strips are of equal length, but when heated they will expand in about the ratio indicated by the dotted lines. If these two strips

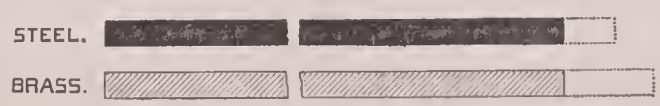


Fig. 8.

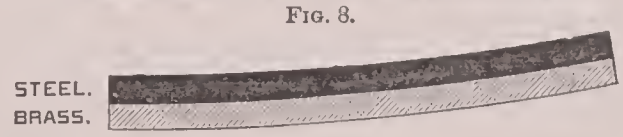


Fig. 9.

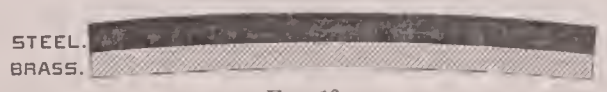


Fig. 10.

were firmly united and then heated, the greater expansion of the brass would force the compound bar to assume a curved form (Fig. 9), but a reduction to its normal temperature would allow it to recover its original form, and a greater degree of cold would cause it to curve in an opposite

direction (Fig. 10). A bimetallic balance is shown in Fig. 11, in which the rim, severed at opposite points, is somewhat deflected by the influence of heat; it will be observed that the result is to reduce the effective diameter instead of enlarging it, thereby lessening the inertia of the balance, so that less force in the hair-spring is needed to move it as required. To compensate properly, it is essential that this reduction shall be exactly equivalent to the sum of all the heat losses. Such losses are not determinable without careful and continued tests. As a means of providing for varying conditions, the balance rims when completed are provided with a series of radial holes, in some of which are fitted small screws with relatively large heads. When put together and tested with an increase of, say, 25° in temperature, the watch might be found to lose six or seven seconds, which would indicate that for such conditions the balance was too large. The remedy is a change in the location of some of the adjusting screws in the balance rim; such, for instance, as the removal of the two screws from position No. 4 to position No. 11, as indicated by the dotted lines. Such a procedure so disposes a portion of the weight that the action of heat serves to carry it nearer to the axis than before, thereby making a greater difference in its effective size. If, in the test, the rate had proved to be a gaining one, it would have indicated that for such conditions the balance was too small, and the movement of the adjusting screws would need to be in the opposite direction.

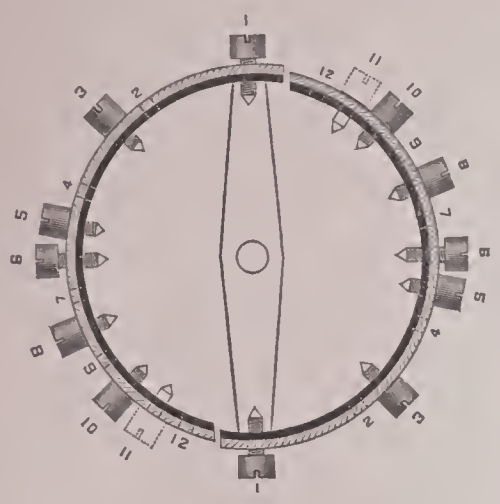


Fig. 11.

History.—The earliest timepieces resembling watches rather than clocks were not designed to be carried on the person, but rather as table ornaments. The resulting practice of elaborately ornamenting the cases, as well as some portion of the movements, was continued for many years, and was applied to portable or pocket watches also. In the collection of rare and curious old watches which has been gathered by Evan Roberts, of England, some of which appeared in the American Waltham Watch Company's exhibit at the Columbian Exposition in 1893, there are some fine specimens of artistic work of that character. Carl Marfels, of Germany, also has a fine collection of similar character. Early watches had but a single hand.

The production of portable time-keepers dates from about A. D. 1500, although it is claimed that Peter Hele, of Nuremberg, made them as early as 1477, and that they were known as Nuremberg animated eggs. The invention of the coiled mainspring is credited to Hele. The verge escapement had been long employed in clocks, and when actuated by a constant power derived from a weight would doubtless give a fairly constant rate, but when that escapement was incorporated as a part of the mechanism of a watch driven by a coiled spring, whose tension was constantly diminished as the spring uncoiled, a uniform rate was impossible without especial devices to derive a uniform stress from the varying force of the coiled spring. The first known contrivance of this description was a sort of brake, so arranged that as the spring unwound less and less resistance would be applied. This device was known as a "stack freed"; it was unsatisfactory, and was succeeded by the greatly superior one of the fusee, said to have been the invention of Jacob Zech, of Prague, about 1525. It consisted of a sort of conical pulley having formed on its periphery a spiral groove. On the arbor of the fusee was fixed the main wheel, and the mainspring barrel served as a drum, around which was coiled a number of turns of a cord of catgut, one end of which was attached to the large part of the fusee and the other end to the barrel, so that the mainspring barrel was turned and the spring coiled up by turning the fusee. When uncoiling, the spring would first pull from the small part of the fusee, and as the pull of the spring grew weaker, it was compensated by a gradually increased leverage, as the uncoiling cord pulled from the larger part of the fusee. The use of chains in place of catgut was introduced in 1664 by Gruet, a Swiss. English watchmakers continued to employ the fusee until the last part of the nineteenth century. Enamel dials were introduced about 1630. Hooke invented the balance spring about 1658.

It has seemed to be the policy of each European watchmaker to make a watch of a model peculiar to himself. This plan renders repairing difficult and expensive, and about 1849 suggested to the mind of Aaron L. Dennison, of Boston, Mass., the idea of manufacturing watches by machinery, and of making large numbers of each part of the movement so uniform in dimensions that they would be interchangeable. In 1850, in company with Mr. Edward Howard, he began the erection of a factory for the manufacture of watches on this plan, which is universally known as the American system. This building was located in what is now Boston Highlands, but within about three years a new factory was built at Waltham, on the Charles river, about 10 miles W. of Boston, and the business moved to that place. A few watches were produced, patterned after the English models, but the public was then distrustful of the ability of Yankees to make watches, so that the demand was limited. The original capital of $20,000 soon disappeared, as did as much more as could be secured, and in 1856 the company made an assignment, the property was put up at auction, and purchased by Royal E. Robbins, of New York, who invested his entire capital in the bankrupt enterprise. By hard work night and day, and by the help of his partners, Henry A. Robbins and Daniel F. Appleton, the business was kept afloat till 1861, when the outbreak of the civil war caused a demand for American watches, which at once assured the success of the enterprise, and since then the growth of the business has been steady. Since 1885 the company has been known as the American Waltham Watch Company. The aggregate number of watch movements produced is (1895) over 7,000,000.

Of the watch-making enterprises undertaken in the U. S. since 1860, not one has escaped financial difficulties, a few were repeatedly reorganized, and of those a few still live, but about twenty became bankrupt and disappeared; of those which have succeeded, the Elgin National Watch Company has been the most prosperous, and its total product approaches that of the Waltham company. Other prominent watch-making companies are the Dueber Hampden Watch Company, of Canton, O., the Waterbury Watch Company, and the New York Standard Watch Company.

Authorities.—F. J. Britten, *Former Clock and Watchmakers, and their Work* (London and New York, 1894); Claudius Saunier, *Traité d'Horlogerie Moderne* (Paris, 1875; Eng. trans., London and New York); Moritz Grossman, *Detached Lever Escapement* (Leipzig, 1866); Phillips, *Mémoire sur le Spiral Réglant* (Paris, 1861); C. E. Fritts, *Watch Adjusters' Manual* (New York, 1894); Henry G. Abbott, *The Watch Factories of America* (Chicago, 1888).

E. A. Marsh.

Watchung Mountains, known also as the Orange Mountains: elevations consisting of a triple range of hills rising to the W. of Plainfield, Orange, and Paterson, N. J. They are about 40 miles long, trend N. and S., and curve abruptly westward at each end. Each of the three divisions of the range is composed of a thin sheet of trap-rock (diabase), which was poured out as a lava flow during the Newark period, and subsequently covered with sand and mud, now changed to sandstone and shale. At a later date the entire series was tilted westward at an angle of from 10 to 15 degrees, and greatly eroded. The trap-rock now stands in relief, and forms hills 300 to 400 feet high, owing to the more rapid erosion of the softer sedimentary beds inclosing it. The Watchung Mountains are similar to the Palisades along the Hudson, but the rock composing them was poured out as surface flows, as already stated, while the Palisades sheet was forced in between sedimentary beds, and, so far as known, did not reach the surface. I. C. R.

Water [O. Eng. *wæter* : O. H. Germ. *wazzar* (> Mod. Germ. *wasser*) : Icel. *vatn* : Goth. *watō*; cf. O. Bulg. *voda* : Gr. *ὕδωρ* : Sanskr. *udán*; cf. Sanskr. *ud-*, to wet, Lat. *un'da*, water, wave, and Eng. *wet*]: a tasteless, inodorous, and transparent fluid, a compound of hydrogen and oxygen, and represented by the chemical formula H_2O. The importance of its functions in the mineral, vegetable, and animal kingdoms, its peculiar properties, and the numberless uses made of it, consciously and unconsciously, by man make it worthy of the most attentive study.

Occurrence in Nature.—Water in the state of vapor is always present in the atmosphere. On the one hand, this vapor is continually condensing to liquid water, which makes its appearance as cloud, fog, or mist, as rain, snow, or hail, falling upon the earth's surface, or deposits directly on cold solid surfaces as dew or frost. On the other hand, new supplies of vapor are continually entering the atmosphere by evaporation from surfaces of liquid water, as that of the ocean, from moist earth, and from the bodies of plants and animals.

In the liquid state a vastly larger quantity of water is found, covering something like eight-elevenths of the earth's surface with ocean, while less extensive bodies of this substance present themselves as seas, lakes, rivers, and springs. Moreover, liquid water occurs to no small extent diffused through soils and porous rocks, and forms a large part of the bodies of plants and animals.

As a solid—ice—we find great masses permanently covering the coldest parts of the surface of the globe, in the polar regions, and about the summits of the higher mountains, and temporarily extending to lower levels and more temperate regions during the colder portions of the year. Much of the ice found in largest masses represents highly compressed and consolidated snow; the slowly moving solid streams of this which descend valleys are known as glaciers, and the detached masses from the lower ends of these which reach the sea and float away, along with large masses of floating ice which has formed on the surface of the sea itself, are spoken of as icebergs and ice-floes; these when they reach warmer regions melt and return to the liquid form.

In much smaller quantity water is also encountered as a chemical constituent of minerals, such as gypsum, which sometimes form rock-masses.

A rough calculation of the quantity of water known to exist on the earth's surface in the three states of vapor, liquid, and solid is as follows:

	Millions of metric tons (of 1,000 kilog.).
Total weight of water in the gaseous state existing in the atmosphere at any one time (on the basis of the average tension of aqueous vapor of the Challenger observations), about.....	115,000,000
Total weight of liquid water on the surface of the earth, about.....	1,255,737,000,000
Total weight of solid water (ice) on the earth's surface (probably a low estimate, especially as regards the extent of the south polar ice cap), about.....	6,373,000,000
	1,262,225,000,000

If this be stated, as respects distribution in the three physical states, in the form of parts per million, we have—

In the state of vapor.....	91
In the state of liquid.....	994.860
In the state of solid.....	5,049
	1,000,000

The estimate of aqueous vapor in the atmosphere is doubtless too high, being based on vapor-tension observations made at sea; possibly one-half or two-thirds might be taken to be nearer the truth. If but 30 inches of annual rainfall be assumed as the average for the earth's whole surface, this will represent an annual distillation (and condensation as rain or snow) of about 387,000,000 millions of metric tons of water. See RAIN, SNOW, HAIL, ICE and GLACIERS.

Important Natural Functions of Water.—The mobility of the particles of this, the only liquid substance occurring in nature in large quantity, renders it the vehicle for the application of mechanical energy on the grandest scale in modifying the earth's surface, cutting away and removing the solid material of the higher portions of the land, and sweeping such material down to lower levels or into the ocean, of which the coasts are altered by water-currents; while the expansion of water in freezing disintegrates rocks and soils, and ice itself plays its part as an abrasive and shares in the transport of solid matter from place to place. (See GEOLOGY). The mechanical effect of the expansion of water in freezing is observable also in the disruption of the tissues of living plants, and the pulpy condition of animal flesh which has been frozen, leading to speedy putrefaction.

Water is peculiarly fitted by some of its special physical properties to serve also as the vehicle for the distribution of heat. As aqueous vapor in the atmosphere, as liquid water in the ocean and in lakes, and as changing its state by freezing or melting, evaporating or condensing, its influence is of the highest importance in maintaining in general, and, under special conditions of season and weather, of modifying the distribution of heat on the earth's surface, and determining the climate of its various parts. (See METEOROLOGY). A like part is played by the same substance in our own bodies, conveying heat from the seats of its development to the parts where it is dissipated, dissipating it by evaporation from the skin and lungs, and maintaining the needful equilibrium of temperature.

The relations of water as a solvent of great and varied power both for solids and gases give it still further the character of the restless agent of change in nature. The permanent gases of the atmosphere are brought down in solution to do their work upon the mineral crust of the globe, and to perform a part of their duty in the maintenance of plant and animal life, while the rocks and soils of the land are leached by the water continually distilled over them as rain, part of the matter brought into solution serving for plant nutrition, and most of the remainder being borne to the ocean, on which it confers its saline character.

As a chemical agent water is found changing feldspar and other minerals into clay, forming or modifying particular metallic ores, taking part in the chemical processes of vegetable and animal nutrition, and aiding in the changes of putrefaction and decay by which the material of organized structures is restored to the mineral forms from whence it came.

Industrial Applications.—Beside the indispensable use of water for drinking, it is applied by man indirectly to endless purposes of utility and convenience. As a vehicle for mechanical energy in the work of the water-wheel, in hydraulic mining, in the mechanical separation of ores, as the means of making available in the steam-engine the potential energy of fuel, as the basis for transportation on the largest scale by ocean, lake, river, and canal, as the vehicle of heat distributed by hot water or steam, as a solvent in metallurgy and the manufacture of chemicals, in brewing, distilling, dyeing, tanning, soap-making, in connection with pottery and the use of mortar and cement, and in a thousand other directions man's work would stop were he deprived of this material. See WATER-POWER, HYDRAULICS, HYDROSTATICS, HYDRAULIC ENGINES, STEAM-ENGINE, WATER-WHEELS, etc.

Process of completely Purifying Natural Water.—Water is never found pure in nature; it always contains in solution varying quantities of foreign solids and gases. If we desire to examine its properties in the pure state, either these foreign substances, of which the particular character will be noticed further on, must be separated, or water itself must be artificially produced by chemical combination of its elements. The former method is generally used. Clear rain or spring water has added to it a small quantity of permanganate and hydroxide of potassium, is allowed to stand for twenty-four hours, and is then slowly distilled from a vessel of block tin or tinned copper, in the upper part of which are perforated diaphragms to arrest any drops of liquid carried up, the steam being condensed in a tube of tin cooled from the outside. To separate traces of ammonia the condensed water is redistilled after having added to it a minute quantity of acid sulphate of sodium, and the vapor is now condensed in a tube of platinum. Finally, to expel dissolved air, the doubly distilled product is boiled down to two-thirds of its volume in a platinum vessel and allowed to cool in the vacuum produced by an air-pump.

Physical Properties of Water in a Pure State.—As seen at common temperature, water is a readily mobile liquid, transparent and colorless when in small quantity, but in mass appearing blue by transmitted light, without smell or taste. Its density at 4° C. (in England at 60° or 62° F.) is assumed = 1, and is made the common standard of comparison for the densities of other liquids and of solids. The mass of 1 cubic decimeter of water at 4° C. and under normal pressure (760 mm.) = 1 kilog. One cubic inch of water at 62° F. and normal pressure (30 in.) = 252·286 grains. Water yields but little to compression; each additional atmosphere of pressure reduces its volume by ·0000462 at about 18° C. It presents greater cohesion between its particles than any other liquid, and rises to a greater height in capillary tubes.

In the solid state water is also colorless, or in mass blue, and occurs crystallized in forms of the rhombohedral system, snow often forming six-sided stars produced by slender hexagonal prisms. If solid water (ice) at a temperature well

below its melting-point be heated, it expands like other solids, gaining in volume by about ·000077 for 1° C., until it melts. The melting-point under normal pressure (760 mm.) is made the zero of the centigrade scale of the thermometer (32° on the Fahrenheit scale), but it is lowered by increase of pressure, at the rate of ·0075° C. for each additional atmosphere; on this effect of pressure depends the regelation of ice, two pieces at the melting-point uniting when pressed together and the pressure afterward relieved, or a large mass, as a glacier, changing its form under varying pressure. Clear water when at rest may be cooled several degrees below the normal melting-point without freezing, but agitation quickly causes the formation of some ice, and the temperature goes up to 0° C. The so-called latent heat of fusion of water is greater than that of any other substance; the heat required to melt 1 part of ice at 0° to water at 0° suffices to raise the temperature of 79·25 parts of the water by 1°. Unlike most substances, ice in melting contracts, so that 1,000 parts by volume of ice produce but 917 parts of water; hence ice floats upon water, and vessels or pipes completely filled with water are burst when the water freezes.

If water at 0° be heated, contrary to the general rule, it contracts until the temperature of 4° C. (or, more exactly, 3·982°) is reached, but at that point begins to expand with increase of temperature, like most liquids, so that 4° C. is spoken of as the temperature of the maximum density of water. The existence of this point of maximum density involves a number of important consequences in the economy of nature. 1,000·122 volumes of water at 0° become 1,000 at 4° and 1,000·118 at 8°. Above 4° expansion continues at an increasing rate with increase of temperature: 1,000 volumes at 4° C. become 1,000·847 at 15°, 1,001·731 at 20°, 1,004·25 at 30°, 1,007·70 at 40°, 1,011·97 at 50°, and 1,043·23 at 100°. The specific heat of water (i. e. the quantity of heat required to raise the temperature of 1 part of water by 1°) is greater than that of any other known single liquid, and increases as the temperature rises. Its value between 0° and 1° C. is taken as the unit of comparison for specific heat. The specific heat of ice is much less than that of liquid water—namely, about ·504, and that of steam is still less, ·369 under constant volume, or ·4805 under constant pressure.

Water evaporates at all temperatures, even when it exists as ice or snow, and into empty space or space occupied by air or other gases. The tension of the vapor formed increases as the temperature rises: at —20 °C. it is equal to ·9 mm. of mercury in the barometer, at 0° = 4·6 mm., at + 20° = 17·4 mm., at 50° = 92 mm., at 100° = 760 mm. (this 760 mm. representing normal pressure; under it the temperature at which water boils is counted as 100° on the centigrade scale of the thermometer), at 150° = 3,581·2 mm., at 200° = 11,689 mm. The boiling-point of water with freely exposed surface being taken at 100° C. (or 212° F.) under normal pressure, is lower as the pressure is reduced and higher as the pressure is increased; it is practically affected by some other circumstances, as by the nature of the surface of the vessel in which it is heated. The critical temperature for water (at which it becomes a vapor under any pressure) is 370° C., the critical pressure being 196 atmospheres. The latent heat of vaporization of water is greater than that of any other substance; the heat required to convert 1 part of liquid water at 100° into steam of 100° suffices to raise the temperature of 534 parts of water at 0° by 1°; this amount of heat becomes greater if the water be evaporated at lower and less if at higher temperature. In changing to colorless, invisible vapor, water increases greatly in volume; 1 volume of liquid water at 100° produces under normal pressure 1,632 volumes of steam. The density of steam is nearly 9 as compared with hydrogen, or ·625 as compared with air.

Liquid water is a bad conductor of heat and electricity as compared with such substances as the metals. Heat sufficient to raise ·154 milligrammes of water from 0° to 1° C. passes per second through a layer of water 1 mm. thick and 1 sq. mm. area with a difference of temperature of 1° between the two surfaces. The electrical resistance of 1 mm. of water equals that of 40,000,000 km. of copper wire of same area. The index of refraction of light is for water of common temperature about 1·331. The absorption spectrum of water vapor is chiefly characterized by five groups of absorption bands in the red and yellow.

Chemical Nature of Water.—From the earliest times water seems to have been generally looked upon as one of the simplest or most elementary substances. Only in the second half of the eighteenth century was its true nature discovered, at about the same time that clear ideas began to be formed of the existence of chemical elements in the sense in which the word is now understood—that is, of substances which can not be decomposed or separated into dissimilar constituents. In 1781 Cavendish, experimenting on the changes undergone by common air in which substances are burned, showed that "inflammable air" (*hydrogen*), which was already known and had been distinguished by him as a peculiar gas in 1766, when added to "dephlogisticated air" (*oxygen*) formed an explosive mixture, which, fired by an electric spark, left as residue a "condensed liquor," which was pure water. (See CHEMISTRY.) In 1783 Watt, without making new experiments of his own, expressed the opinion that water is a compound of the two gases which we now call hydrogen and oxygen, and in the same and the following year Lavoisier and Meusnier prepared hydrogen from water by passing it as steam over heated iron, determined the quantity of hydrogen obtained, and the gain in weight of the iron by combining with the oxygen. The chief methods used since have been the formation of water by exploding together hydrogen and oxygen (repetition, in more refined form, of Cavendish's experiment), the decomposition of water by an electric current (producing from it hydrogen and oxygen as gases), and the formation of water by passing hydrogen over heated oxide of copper (weighing the water formed and finding the quantity of oxygen contained in it from the loss of weight of the metallic oxide).

Water is composed pretty nearly of 1 part of hydrogen united to 8 of oxygen by weight, and will yield 2 parts of gaseous hydrogen and 1 part of gaseous oxygen by volume, but there is still some question (of no small importance to the scientific chemist) as to the precise proportions. If Prof. Morley's last determination of the volumes of hydrogen and oxygen combining to form water—namely, 2·0002 : 1—be adopted, along with Lord Rayleigh's last determination of the density of oxygen—namely, 15·882—the composition of water by weight will be—

Hydrogen.....	2 atoms,	2·00 or	11·186
Oxygen.....	1 atom,	15·88 or	88·814
		17·88	100·000

The molecular weight of water in the gaseous state is 17·88, but for the liquid state the value may not improbably be double this, or even a higher multiple.

Physical Relations of Water to other Substances.—Solid substances which are not visibly "wetted" by water often retain it in a mechanically adherent state, as so-called hygroscopic moisture, so that while dry to the touch they give off, on being gently heated, vapor which condenses to liquid water on cooling; this is specially noticeable in the case of porous substances, such as charcoal, seemingly dry earth, etc.

Water acts as a solvent for a remarkably large number of solid and gaseous materials, and also dissolves or mixes with very many other liquids. No substance is so useful in bringing to the liquid condition of a solution an immense variety of other materials without changing their chemical nature. In a large proportion of the most familiar liquids, such as blood, milk, wine, beer, vinegar, liquid ammonia, etc., water is really the chief substance present. The mobility of the particles of a dissolved solid and the condensation into smaller space of a dissolved gas, which loses its elasticity, not only admit of such substances being easily carried from place to place with the solvent water, as in the flow of blood through arteries and veins, but also greatly increase the readiness with which such substances enter into chemical changes between themselves or with outside materials. Aqueous vapor is by some solids taken up from the air in such quantity that a solution of the solid gradually forms, as in the case of common potash, which, when exposed to the air, runs down to a lye; such substances are said to deliquesce. See SOLUTION.

When substances dissolve in water there is generally change of volume, most commonly contraction when the substances in question are solids or liquids, expansion when they are gases. Changes of temperature are also observed in connection with solution, the physical result of dissolving a solid being lowering of temperature (most notable when the water is taken in the form of ice or snow, and itself becomes liquefied, as in the common mixture of ice and salt used to freeze ice-cream), while the solution of a gas, such as ammonia, produces rise of temperature. Fre-

quently there is evidence in the amount of heat given out or absorbed that chemical action is also going on, and it is often not easy to separate clearly its effects from those of simple solution.

The presence of foreign substances in solution in water tends to lower the temperature at which the water freezes, so that sea-water, containing chiefly common salt, may be exposed to a temperature below 0° C. without any ice forming in it. When so far cooled that ice does form, this ice, if separated and melted, yields nearly pure fresh water, though it has been recently shown that it always retains a little salt in solid form, either entangled in or perhaps united to a portion of the water. The presence of foreign solids in solution tends, on the other hand, to raise the boiling-point of water, so that the latter may be heated much above 100° C. under normal pressure without boiling. Thus a saturated solution of saltpeter may be made the means of applying a temperature above 115°.

Chemical Relations of Water to other Substances.—Water is so commonly employed to dissolve other materials, and hence as the vehicle by means of which they are brought to act upon each other, that the chemical action of the water itself, the formation of new portions of water by chemical interaction of other materials, or the disappearance of water the elements of which have formed new associations, may easily be overlooked, and in fact many of the errors of early chemistry are traceable to neglect of such facts.

Chemical Compounds formed by Water.—What are called *hydrates* are substances formed by the combination of water with some other materials, in definite proportions by weight and under conditions which suggest that the water itself retains its original chemical constitution. Thus if chlorine gas be passed into water but little above the freezing-point a solid compound of chlorine and water separates out in pale-yellow crystals; this contains 27·7 per cent. of chlorine. In like manner, at — 20° C. a crystallized compound of 46 parts of alcohol and 216 of water is produced. In many cases saline solutions on being cooled become concentrated to a certain point by the freezing out of ice, and then the remaining solution (containing a definite amount of the dissolved saline substance) solidifies throughout to a crystallized mass; such masses are spoken of as *cryohydrates*. In the case of common salt, 180 parts of water and 58·5 parts of salt solidify to a cryohydrate at about — 23° C.

A large number of substances commonly seen in crystals permanent at common temperatures, such as alum, copperas, Rochelle salt, etc., contain definite amounts of water, known as water of crystallization, the presence of which is essential to the crystallized form and often to other properties of the substance, such as its color. There are, however, many crystallized substances which contain no water, and in those which do contain it the amount present varies; thus calcium sulphate crystallizes with 2 molecules of water, copper sulphate with 5 molecules, common iron sulphate with 7, sodium sulphate with 10. The same substance may assume different crystal forms by combining with different, but in each case definite, amounts of water; thus sodium sulphate forms crystals containing 10 molecules of water, or 7, or none at all. "Isomorphous" salts contain the same proportion of water in the crystals. Water of crystallization is generally removed with ease by moderate heating, as in the preparation of plaster-of-Paris or stucco from gypsum; when the calcined plaster is mixed with liquid water the setting or hardening which soon afterward takes place is the result of recrystallization with the resumption of the original proportion of water. In heating crystallized salts it appears that definite fractions of the water present are retained with different degrees of tenacity. Some crystallized salts give off in fairly dry air more or less of their water of crystallization in the form of aqueous vapor, crumbling down in doing so, and are said to effloresce; common sal-soda, or crystallized sodium carbonate, used in washing, is an example of this.

Chemical Changes involving the Production of Water.—It has been already mentioned that when hydrogen gas burns in an atmosphere of oxygen or in common air, which is diluted oxygen, the product of the combustion is water. In the burning in the air of many common forms of fuel, such as wood, bituminous coal, kerosene, illuminating gas, etc., of which hydrogen is a constituent, water is formed in large quantity, though it may be overlooked in consequence of its not immediately condensing, but going up the chimney or otherwise mingling with the atmosphere as aqueous vapor. When hydrogen is passed over any one of many heated metallic oxides, as the oxide of iron or of copper, water is formed and volatilized, while the metal is reduced to the free state. Many hydroxides of the metals are decomposed by heat, forming water and the corresponding metallic oxides; the temperature required for this decomposition varies, cupric hydroxide undergoing partial decomposition at the boiling-point of water, while slaked lime (calcium hydroxide) is resolved into water and lime only at a bright-red heat. When an acid acts upon a metallic hydroxide or oxide, water is formed and a metallic salt simultaneously produced, and in like manner alcohols, which are hydroxides of organic radicles, react with acids to produce water and "esters," or salts of these radicles. In numerous other processes affecting organic substances, such as the production of aldehyde from alcohol, aniline from nitrobenzene, etc., water is formed by the union of hydrogen and oxygen derived from the materials used. In the complex changes which occur on strongly heating organic matter in closed vessels, in so-called destructive distillation, as in making charcoal, coke, etc., water generally presents itself among the products, often in large amount. From the lungs and skin of living animals water is freely given off, most of it simply evaporated, having been taken into the body as pre-existing water, but some of it formed by the oxidation within the body of substances containing hydrogen and derived from the food consumed. In the slow decay of the bodies of both plants and animals after death large quantities of water are formed and evolved.

Chemical Changes involving the Decomposition of Water.—When metallic oxides of well-marked acid or basic character are brought into contact with water the latter often ceases to exist as such, and loses its characteristic properties, but its elements, hydrogen and oxygen, take their places as constituents of new substances, to which the names acids and bases respectively are properly given. Thus sulphur trioxide by its interaction with water forms sulphuric acid, and freshly burned lime, or calcium oxide, forms, in the ordinary slaking of lime with water, calcium hydroxide. In such actions heat is often given off to a remarkable extent; wooden buildings or ships may be set on fire and gunpowder ignited by the slaking of lime in large quantity. Chlorine decomposes water gradually at common temperature, especially in daylight, combining with the hydrogen and setting free oxygen, and this oxygen at the moment of its liberation appears to be the chief effective agent in the common processes of bleaching and disinfecting by chlorine, moisture being always present. Many of the metals, on the other hand, decompose water, uniting with the oxygen and setting free hydrogen; sodium does so at ordinary temperature, magnesium at the boiling-point of water, iron at a red heat. At a red heat carbon decomposes water, liberating most of the hydrogen, but combining with a little of it to form marsh-gas, while carbon monoxide or carbon dioxide, or both of these, are produced. On these interactions depends the manufacture of the so-called water-gas, now very largely used for heating, and, after further special treatment, for illuminating purposes. Phosphorus pentachloride reacting with water forms phosphoric and hydrochloric acids, and in like manner acetyl chloride and water yield acetic and hydrochloric acids. By distillation with superheated steam fats are resolved, taking up the elements of the water, on the one hand, into fatty acids used in the manufacture of candles, and on the other into glycerol (glycerin), useful as the source of the most energetic of modern explosives and in a number of other directions.

Chemical Decomposition of Water by Physical Means.—When heated to a sufficiently high temperature water undergoes "dissociation"—that is to say, separates into its component elements, hydrogen and oxygen; these, however, recombining if they remain mixed with each other when the temperature gradually falls. Thus fused or white-hot platinum dropped into cold water causes a few bubbles of gas to escape, which are found to consist of oxygen and hydrogen in the proportions yielded by water, or, much better, by passing steam through a tube of porous earthenware, surrounded by one of glazed porcelain, and raised to something like a white heat, an indifferent gas being made to surround both surfaces of the porous tube, hydrogen may be collected from the outer side of the latter, having when liberated passed through the porous material more rapidly than oxygen, while oxygen may be withdrawn from the interior of the porous tube.

Although water itself in the purest condition in which it can be obtained is scarcely at all decomposed by the passage through it of an electric current, if a little sulphuric acid, sodium sulphate, or any one of a number of more easily decomposable substances be added, such added material may be separated into products which by their several actions upon water set free from it its constituent elements, reproducing at the same time the added material itself, to serve over and over again in the same way, so that by this "secondary electrolysis" water is practically resolved with ease into its constituents, the oxygen making its appearance at the positive, and the hydrogen at the negative pole.

In the production of 1 part of liquid water of atmospheric temperature by burning together hydrogen and oxygen gases, heat is evolved to the extent of about 3,830 units, i. e. heat enough to raise the temperature of 3,830 similar parts of water by 1° C.

Natural Waters.—All natural waters, such as must be depended upon for the practical use of man, contain foreign substances, of kinds and in amounts varying with the circumstances under which the water has been collected or to which it has previously been exposed. Some are originally gaseous, a few liquid, and both of them occur in the state of solution; many are originally solid, and of these some are dissolved and others simply suspended in the water. Of solid matters in suspension, some are mineral in character, others are derived from the vegetable and animal kingdoms, and in the latter case may be destitute of or may present organized structure, and if organized may be dead or living. In relation to the indispensable and extensive application of water to practical purposes it is important to consider the character, as respects these foreign substances, of natural waters under the conditions which surround them as they occur in large quantity.

Water as Precipitated from the Atmosphere—Rain, Snow, Hail.—When water condenses in the atmosphere from the state of vapor to that of liquid, it dissolves, in falling through the air, the gases of which the latter consists, and such soluble solid matter as may be present in a finely divided condition and in suspension, and it mechanically washes down with it insoluble suspended particles of dust. The proportion in which these substances are found in rain-water varies greatly with local conditions; it is generally much less after long-continued rain than in rainfalls following dry weather, and less in winter than in summer. The principal gases found in rain-water are nitrogen, oxygen, and carbon dioxide (often called carbonic acid), the second, and still more the third, of these occurring in larger relative proportion than in the air,* on account of greater solubility in water. On the average they are present in rain-water to about the following extent:

Nitrogen (and argon)..	13,080	parts in a million by volume.
Oxygen.....	6,370	" " " "
Carbon dioxide.....	1,280	" " " "

Ammonia is found as carbonate, nitrate, or nitrite to the extent of from ·05 to 1·55 parts—on the average about ·49 part per million by weight; occasionally a good deal more than this has been observed. Nitric and nitrous acids, chiefly as ammonium salts of these acids, are often present; in England from 0 to ·44 part—on the average about ·07 part per million by weight—has been found; larger amounts have been occasionally recorded. In cities burning large quantities of coal very appreciable quantities of sulphurous and sulphuric acids, derived from the sulphur of the coal, are washed down by rain; thus in the rain-water of English and Scotch cities, the equivalent of from 20·5 to 70·2 parts per million of sulphuric acid has been found, much of it in the free state. In the neighborhood of the sea sodium chloride (common salt) appears in rain-water; one analysis of a sample collected at the Land's End, Cornwall, gave chlorine equivalent to 359·2 parts of salt per million. Sodium sulphate and calcium salts have also been detected. Soot is common in the rain-water of cities. Mineral dust from the soil (and in cities coal-ashes) is always accompanied by more or less organic matter, sometimes by the pollen of plants, often by microbes, including, it may be, some of disease-producing character, and their spores. The average total amount of solid impurities in rain-water is something like 30 or 40 parts per million. As collected from the roofs of houses it is liable to include grosser impurities, derived from the decay of wooden shingles, the *excreta* of birds, cats, etc.

Surface Drainage Water.—Rain-water which runs off upon the surface of the earth, without sinking into the soil or underlying rocks, begins at once to take up such soluble matter as it comes in contact with, but naturally becomes charged with soluble matter to a less extent than if it had percolated downward to any great depth. Its character depends much upon the local nature of the rocks and soils, especially whether these are, on the whole, siliceous or calcareous, upon the land being bare or clothed with vegetation, and upon the distance which the sample taken has flowed from the seat of rainfall. In such waters the total solid matters in solution average about 50 to 80 parts in a million for siliceous and 140 to 230 for calcareous districts, with somewhat larger figures if the land be under cultivation. The chief substances present are carbonates, sulphates, and chlorides of calcium, magnesium, sodium, and potassium, with silicic acid or acid silicates, and smaller amounts of iron, manganese, and other materials. The organic matter present is chiefly of vegetable origin; it varies much in amount, and is liable to be much increased at times, as during the fall of leaves in autumn.

Spring-water.—Much of the water falling as rain sinks into the earth, and percolates through porous masses of soil, sand, gravel, and rock until it encounters some impervious stratum by which it is retained, and above which it accumulates, until it finds exit at some lower level upon the surface, and makes its appearance as a spring. Spring-water, having come more intimately into contact with the mineral material of the earth's crust, naturally contains a larger proportion of dissolved mineral solids than surface-water—about 60 to 250 parts in a million for siliceous, and 300 to 660 for calcareous regions. The amount of organic matter is generally quite small, nitrates are generally present in appreciable quantity, giving evidence of the oxidation of organic nitrogen, and dissolved oxygen is absent, or present only to very small extent.

Water of Mineral or Medicinally Useful Springs.—When either the ordinary mineral constituents of spring-water present themselves in unusually large quantity, often giving strongly marked taste, or substances not commonly present are met with, such as iodides, bromides, arsenic, sulphuretted hydrogen, etc., the term mineral spring is applied, and the waters from such springs, as well as those distinguished mainly by high temperature ("thermal" waters), are largely used in the treatment of disease. See MINERAL WATERS.

River-water.—The water of streams and rivers is a mixture of surface and spring water, and represents more and more, as smaller watercourses unite into larger ones, the average product of the leaching of the earth on and beneath its surface. The total solids present range generally from about 125 to 350 parts in a million, with some examples considerably outside these limits. The amount of mineral matter in suspension varies greatly as a river is swollen by floods or falls in the dry season of the year, and also with the distance from the mountain sources of the water. Among the gases, carbon dioxide occurs dissolved to a much larger extent than in rain-water. Along the course of rivers the water is subject to pollution by organic matter from decaying vegetation, from the excreta during life of the lower animals and man, from the decaying bodies of animals after death, and from the introduction of sewage and of factory refuse in inhabited districts. On the other hand, a certain amount of "self-purification" takes place by filtration of surface-water over herbage, by the removal of substances taken up by growing plants or by the nutrition of fish and other aquatic animals, by the dilution of polluted water with that from purer sources, by subsidence of suspended solid matters, by absorption of oxygen from the atmosphere and oxidation thereby of organic matter, and to a large extent by the action of bacteria and other extremely minute organisms.

Water of Lakes.—In the case of lakes from which there is large outflow the water generally resembles that of rivers, and water of very great purity is often obtainable from mountain lakes supplied from limited areas of uncultivated land with underlying siliceous rocks. Such lakes serve the purpose of subsidence reservoirs, and, as in the case of the Lake of Geneva, water which comes in turbid leaves the lake clear. But lakes which discharge little or no liquid water, while subject to constant evaporation, present water often highly charged with saline matter and quite unfit for drink-

* The newly discovered minor constituent of the atmosphere, *argon*, is more soluble in water than nitrogen, and has been found to occur in the dissolved gases of rain-water in larger proportion than in the air.

ing. In such water sodium chloride is usually most abundant, but the sulphate, carbonate, and borate of sodium are also met with in some cases.

Sea-water.—Such water, condensed upon the surface of the land, as escapes evaporation on its way down to the ocean carries to the latter the suspended and dissolved materials it bears along, and forms deposits of silt and mud, while gradually accumulating in solution the soluble saline matter, part of which comes to be afterward removed, especially the calcium salts, by precipitation and by the agency of coral-building organisms. The total amount of saline matter in ocean water varies between about 33,010 and 37,370 parts in a million. Sodium chloride largely predominates, but chlorides, sulphates, and carbonates, and in smaller proportion bromides, iodides, fluorides, and borates of sodium, magnesium, calcium, and potassium are also present, and silver, as well as probably many other elements, occurs in minute traces. Phosphates occur in remarkably minute quantity. Of the gases, carbon dioxide is but sparingly present, usually in less proportion than corresponds to bicarbonates of the basic constituents. For the chemical composition of sea-water, see OCEAN (*Composition of Ocean Water*.

Well-water.—Of wells, the artificial outlets provided for obtaining underground water, three kinds require notice. Common shaft wells, dug to very moderate depths—say, 10 to 100 feet—often pass altogether through porous strata, and situated, as they commonly are, as a matter of convenience, close by human dwellings, are peculiarly liable to suffer contamination of their water by kitchen slops, leakage from urinals and sewers, and the leaching of solid garbage thrown out on the surface of the ground. No other source of drinking-water entails so much danger to health as this, and the danger is enhanced by the two facts that filtration through a considerable amount of pervious earth frequently renders such water clear, sparkling, cool, and attractive to eye and taste, though it may, in fact, be seriously polluted by disease-germs, and that such water may in reality be wholesome and be used for years without any harm resulting, while the occurrence of a single case of typhoid fever in the adjoining dwelling may all at once render it in the highest degree dangerous by the introduction of disease-producing organisms without any warning change in the apparent character of the water. "Driven" wells, established by forcing down a moderate length of iron pipe, perforated at the lower end, and penetrating by a sharp, conical steel point, involve the same danger of surface pollution of the water unless an impervious stratum be passed through to tap a porous bed beneath; in this case the risk is somewhat lessened. So-called artesian wells, bored to great depths—often many hundred, and in some cases several thousand feet—frequently yield good, wholesome water, though sometimes too highly charged with saline materials to be fit for drinking. They are far less exposed to the danger of surface pollution than ordinary shafts or dug wells. The temperature of the water is sometimes quite high, rendering it unfit for immediate drinking, but valuable for washing purposes. See ARTESIAN WELLS.

Relations of Water to Use by Man.—These require to be carefully considered, particularly when the complex conditions present themselves under which the densely crowded populations of large cities live and have to be supplied. In these cases quantity as well as quality of the supply must be taken into account, and the cost of resorting to particular sources for the water needed can not be overlooked. The practical question generally presents itself in this form: From what source or sources can water of the best available quality be obtained in sufficient quantity for the present needs of the population to be supplied, and with reasonable allowance for increased demand in the reasonably near future, at the least cost, and, at any rate, within the limitation of maximum cost feasible?

Quantity of Water-supply.—Rain-water collected from clean roofs and stored in proper tanks or cisterns, water from a number of driven or deep-bored wells, may occasionally be obtainable in sufficient quantity, but for an adequate supply recourse must in general be had to rivers, mountain-lakes, or the water of numerous springs and small streams collected in a reservoir of sufficient storage capacity. In the case of rivers the average flow, and in that of lakes the outflow, must be carefully gauged at various seasons, representing the average of differing years. In the case of a tract of springs and streams, the area of "catchment" must be measured, and the average annual amount of rainfall ascertained, with allowance for evaporation. The loss by evaporation depends much upon whether rain is light and frequent, or heavy and concentrated at particular seasons; also upon the character of the surface—whether bare, or clothed with vegetation—upon the degree of porosity of the surface material, upon the general slopes of the surface and of the stream-beds being abrupt or gradual, and upon the rainfall occurring chiefly in the colder or warmer seasons of the year. In the selection of a catchment area an eye should be had to suitable sites for the construction of dams, to form storage-reservoirs from which water may be as far as possible drawn off by gravity, avoiding the expense of pumping machinery. In estimating the storage capacity of such reservoirs, aside from the advantage of having them large with a view to allowing satisfactory clearance of the water to take place by subsidence, provision should be made for holding a sufficient body of water to tide over the longest drought that can reasonably be expected; such drought in temperate climates may perhaps be estimated as extending to not less than 70 nor more than 300 days. For the amount of water consumed in cities, etc., see WATER-WORKS.

Quality of Water-supply.—The most important aspect in which the quality of water for human use has to be considered is, of course, its wholesomeness as a beverage. In general, it may be said that good drinking-water should be cool and clear—i. e. free from visible suspended particles—without any disagreeable smell or taste, and not capable of acquiring such by standing for a day or two in a clean and well-closed vessel; should contain enough of the gases derived from the atmosphere to give a slight fresh taste distinguishable from the "flatness" of recently distilled or boiled water, and should not contain solid matter in solution to the extent of more than about 300 parts in a million. In the mineral portion of this solid matter no distinctly injurious substance should occur, such as a compound of any one of the poisonous metals. As little as possible of the solid contents should consist of organic matter—usually not to exceed 15 or 20 parts in a million—and it is particularly desirable that decomposing nitrogenous organic matter (usually, though not necessarily, of animal origin), or the substances derived from it which give evidence of its having been present, shall be found, if at all, only in mere traces. Above all, good drinking-water should be free from disease-producing bacteria or other injurious micro-organisms. It is generally considered desirable that drinking-water shall not be "hard"—i. e. shall not contain sodium and magnesium salts in considerable quantity; but the evidence that hard water is necessarily unwholesome does not seem to be conclusive. All these statements must, however, be taken with various limitations, and not too rigidly. Thus some good waters contain notably more solid matter in solution than has been mentioned, and some peaty mountain waters contain much more organic matter, but of non-nitrogenous vegetable character. Many organisms are revealed by the microscope in perfectly unobjectionable water which look alarming, but represent merely harmless rhizopods, crustaceans, etc. Occasionally in water-reservoirs large accumulations form of confervæ, minute sponges, etc., which, dying and decomposing, produce for a time disagreeable taste and smell without seriously affecting the health of those using the water. Even the far more minute bacterial and other organisms which play so important a part in fermentation and putrefactive decay, and among which are to be found the unquestionable carriers or causes of formidable disease, are by no means all of this dangerous character, the majority being harmless.

Water to be used for cooking, especially for cooking leguminous vegetables, as a general rule, should not be decidedly hard, but the presence of a moderate amount of calcium carbonate—say 70 or 75 parts in a million—is said to be advantageous in making tea or coffee, as reducing the proportion of tannin dissolved, and so rendering the beverage less astringent.

For domestic washing purposes the greatest importance attaches to the softness of the water, since the calcium and magnesium salts of hard water "curdle" or precipitate in insoluble form the fatty acids of soap, greatly increasing the necessary consumption of the latter, and producing a disagreeable sticky deposit on the surface of the skin or of clothing. From this point of view a distinction must be drawn between the states of combination in which calcium and magnesium occur in natural waters. A part, sometimes the principal part, consists of the carbonate, which is itself practically insoluble in water, but is dissolved in considerable quantity in the presence of carbonic acid (carbon

dioxide gas in solution), forming what is sometimes called the bicarbonate. The hardness due to this cause is removed by continued boiling, the solvent carbon dioxide gas being driven off and the calcium or magnesium carbonate precipitated—hence the term "temporary hardness" is applied to that due to the carbonates. But calcium and magnesium also occur as sulphate and chloride, and these salts being of themselves soluble in water, are not precipitated by boiling, and the hardness due to their presence is spoken of as "permanent hardness." Water to be used in washing without being heated requires the "total hardness" to be considered, while for that used hot and having been boiled the "permanent hardness" alone requires attention.

For producing steam in the boilers of steam-engines or of heating apparatus the absence as far as possible of calcium and magnesium salts is extremely desirable. During the boiling of the water carbon dioxide is expelled and the carbonates are thrown down, and as the water is removed by evaporation calcium sulphate also deposits in solid form, both these changes giving rise to incrustations or "scale" on the inner surface of the boiler, objectionable in more than one way. The deposited solid material conducts heat badly, and hence serious waste of fuel is caused, the outside of the boiler becomes overheated, the metal is burned away, and the boiler becomes weakened, while it is probable that at least some dangerous boiler explosions are caused by the scale cracking and permitting sudden access of water to the overheated metal. Most boiler deposits from fresh water consist mainly of calcium (and magnesium) carbonate, those from sea-water mainly of calcium sulphate, those from brackish water—as in the case of steamships supplying their boilers at the mouths of rivers—of a mixture of both. The incrustation of marine boilers is now much diminished by condensing and using over again a large part of the water. Calcium and magnesium chlorides, if present in large quantity, tend to produce corrosion of the iron of the inner surface of a boiler, and this corrosion is particularly noticeable in the case of waters containing dissolved oxygen and carbon dioxide in large proportion.

For many special industrial purposes the character of the water used is highly important. Thus, for brewing, freedom from decomposing organic matter is always essential and soft water is generally desirable, but it is said that certain kinds of pale ale require the use of water containing not less than 300 or 400 parts of calcium sulphate per million. For bleaching and dyeing it is important that the water used shall be quite free from iron and manganese, shall not be acid, and in most cases shall not be hard, but in dyeing with certain colors the presence of a small amount of lime is desirable. For tanning, freedom from decomposable organic matter, softness, and the absence of an excess of chlorides are the chief requisites. For sugar-refining the occurrence of alkaline salts, especially nitrates, in unusual amount is objectionable. For paper-making water should be soft, and especially free from iron even in minute quantity.

For many purposes the quality of water is practically unimportant, as, for instance, for washing off vehicles, the fronts of houses, and the surfaces of sidewalks and streets in cities, for watering roads to keep down dust, for extinguishing fires, and the like. Owing to the great and ever-increasing difficulty of securing for large cities a sufficient supply of water of good quality, it has been suggested, and to a very limited extent the suggestion has been acted upon, that two separate supplies be provided—the one of water as pure as possible, to be used only for those purposes for which purity is important, the other of water of inferior character for all other purposes only. Such an arrangement carries with it some very great advantages, but is not free from practical difficulty. The expense of duplicate systems of distributing pipes and the risk of mistakes being made by careless people as between the two supplies have to be considered.

Examination and Inspection of Water for Human Use, especially from a Sanitary Point of View.—In judging of the quality of water chemical examination is chiefly resorted to, but this is beginning to be supplemented by biological study, and sanitary inspection of the sources of possible contamination of a water-supply is also highly important. The greatest care should of course be taken in collecting, preserving, and transporting samples of water to be examined so that the results of examination may really represent the water in its original condition. Only perfectly clean glass bottles with glass stoppers should be used to contain such samples.

Chemical Examination of Natural Waters.—This chiefly involves attention to the following points, to which space permits only brief reference. For numerous details and precautions requiring to be observed, special treatises on this branch of analytical chemistry must be consulted. The condition of the water as to clearness or turbidity is noted, and if deemed necessary suspended solid matter is filtered off and its quantity determined by weighing. The color of the water is noted as seen in a tube of 2 feet in length. A nearly pure greenish-blue color is presented by the purest water, while those of less purity are often distinctly yellowish green, yellow, or brown. Any smell or taste is observed, and also acid or alkaline reaction to test-paper, repeating the last-named observation with a portion of the water which has been boiled to expel carbon dioxide. The total amount of solid substances in solution is found by evaporating gradually to dryness a certain quantity of the water and weighing the residue after it has been dried at about 100° or 110° C. The dissolved gases can be expelled by prolonged boiling in a specially constructed apparatus avoiding mixture with air, their total volume measured, the carbon dioxide removed by caustic potash, the oxygen by the further addition of pyrogallol, and the volume of each of these ascertained by measuring the residue. The unabsorbed portion is usually nitrogen. The "total hardness" is determined by adding to a known quantity of the water in a stoppered bottle a dilute solution of soap of known strength, the addition being gradually made in small portions from a measuring vessel, and the bottle shaken after each addition. As long as the water still contains calcium and magnesium salts the soap added is curdled or precipitated, and the froth formed on shaking speedily disappears; but as soon as the calcium and magnesium salts have been all removed from solution and a small excess of soap has been added the froth becomes more permanent. When it remains visible for, say, five minutes, the quantity of soap solution which has been used is noted, and becomes the measure of the hardness of the water. This is often expressed in "degrees" of hardness, each degree being understood to mean the presence of calcium and magnesium salts equivalent in soap-curdling effect to 1 grain of calcium carbonate in each imperial gallon of water. A second experiment made in the same way upon a sample of water which has been thoroughly boiled gives the "permanent hardness," and the latter subtracted from the former result gives the "temporary hardness." Salts of the poisonous metals may be sought for by the appropriate tests for each, using large quantities of water, since such impurities, most of them likely to occur only under special conditions, such as those of mining districts, the neighborhood of special factories, etc., are usually met with in extremely minute amount only. Such metals most claiming attention are lead, zinc, copper, arsenic, barium, and chromium. In examining water for technical purposes, iron, which is not poisonous, may need to be looked for; its quantity may be determined by the colorimetric use of potassium ferrocyanide.

By far the most important question is that of the amount and nature of the organic matter present. It must be remembered that the term organic matter is a vague one, that under it are included endlessly numerous substances, consisting essentially of the same elements—carbon, hydrogen, oxygen, and nitrogen—united in different proportions, that for very many of these substances no distinctive tests are available, and that many of them are absolutely harmless when swallowed, while others are in a very high degree injurious to health; furthermore, that chemistry affords us no means of distinguishing unorganized, dead, and biologically inert organic matter from that which constitutes the material of organized and living structures, capable of indefinite self-multiplication when surrounded by suitable conditions. Modern investigation has shown the immense importance attaching to the minuter forms of living organisms in connection with fermentation and putrefaction, and with the propagation of disease. Chemical examination of water in regard to organic matter can never enable us to decide absolutely as to a given water being wholesome or unwholesome, but it may render valuable service by indicating whether such water is to be regarded as suspicious, and if so in what degree, suggesting caution in its use, and a search for possible sources of contamination, as also by drawing attention to changes of a suspicious character occurring in water which has formerly been used with safety. By evaporating to dryness a known quantity of water, at a gentle heat and with special precautions to exclude dust,

decomposed mineral carbonates, etc., and burning the residue completely in a small glass tube with cupric oxide, the carbon may be determined as carbon dioxide and the nitrogen as elementary nitrogen gas, and from the quantities of carbon and nitrogen, and the proportion borne by the former to the latter, an approximate idea may be formed of the amount of organic matter from which these elements have been derived, as also of its general character, since animal material is generally, though not always necessarily, more highly nitrogenous than that of vegetable origin, and on the whole more is to be feared from animal than from vegetable contamination. Other processes look to an estimation of the carbon or nitrogen separately. Thus by treating the water under examination, either at common temperature or boiling hot, with an acidified solution of permanganate of potassium of known strength, the latter loses its deep-purple color as long as it gives off oxygen to oxidize the organic matter present, and hence a determination of the quantity of the permanganate thus decolorized becomes a measure of the quantity of oxygen it has furnished, and this indirectly, though only by rough approximation, indicates the presence of more or less organic matter oxidized—the indication bearing much more on the carbon than on the nitrogen. Distillation of water to which a little sodium carbonate has been added drives off any ammonia present, this ammonia having usually been, in part at least, derived from the nitrogen of decaying organic matter; its quantity, even when very minute, can be easily determined by the application of the Nessler test solution. If water which has already been thus treated have added to it a strong solution of potassium permanganate, and the distillation be continued, a further portion of ammonia is obtained, to be determined as before; this second portion may be assumed to come from the more or less extensive decomposition in the retort of nitrogenous organic matter still in the water, and as substances allied to albumen form a very large proportion of such matter in the bodies of plants and much more in those of animals, the name albuminoid ammonia is often given to that obtained in the process under notice, that obtained in the first distillation being referred to as "free ammonia"; the predominance of free ammonia indicating a more, that of albuminoid ammonia a less, advanced stage of decay of nitrogenous organic matter. In the decay of such matter under special conditions, including the presence of a special ferment organism—a *micrococcus*—nitrates and nitrites are often produced, and a very high degree of importance deserves to be attached to the presence of these salts in unusual quantity, though a small amount of nitrates may be found in the best waters, being partly of atmospheric origin. Nitrites may be determined colorimetrically by the use of solutions of sulphanilic acid and a salt of naphthylamine; nitrates and nitrites together by applying the same solutions after conversion of nitrates into nitrites by reduction with zinc dust; or the nitrogen of both classes of salts may be evolved as nitrogen dioxide by shaking up with strong sulphuric acid over mercury and the evolved gas measured. More weight should generally be given to the presence of an unusual amount of nitrites than of nitrates, the former being in general more significant of decay still going on; ordinarily the formation of nitrites seems to precede that of nitrates, though under certain conditions the latter may revert to the former. Nitrites are specially significant in the water of shallow wells and of rivers; but little importance attaches to them in the case of natural springs and deep-bored wells when not exposed to surface pollution. The greater abundance of chlorides in most animal than in most vegetable material makes the quantitative determination of chlorine in water an indication of considerable value; it is easily effected by means of a solution of silver nitrate of known strength, which precipitates insoluble silver chloride. The pollution of shallow wells by the drainage into them of urine may often thus be detected, as urine contains chloride of sodium in very notable amount. It is to be remarked that such substances as ammonia, nitrates, nitrites, and chlorides are in themselves entirely harmless, certainly in any such quantities as ever present themselves in drinking-water, and therefore that their determination in water analysis is only important as indirectly throwing light upon the question of present or past contamination of the water by decaying organic matter. It is also to be noticed that sometimes the presence of these substances may be accounted for in other and unobjectionable ways; thus chlorides are to be looked for in unusual quantity in the neighborhood of the ocean, or may find their way into wells from the throwing out of spent freezing mixtures of ice and salt used in making ice-cream; ammonia might be accounted for by the neighborhood of gas-works, or nitrates by that of a gunpowder-mill, etc.

Biological Examination of Natural Waters.—Much labor has already been expended, with the aid of the microscope and of the refined "culture methods" of modern biologists, upon the study of the relations to potable water of the swarming hordes of microbes or minute living organisms which are always more or less present in it. Great difficulties, however, are encountered, and much yet remains to be done. The determination of the number of microbes in a given small volume of the water examined—often extending to tens or hundreds of thousands in a single cubic centimeter—requires the immediate study of a sample after its collection, owing to the enormous rapidity with which these organisms multiply, and the value of the result is greatly diminished by the fact that the larger proportion of species of such organisms are harmless, and their presence without sanitary significance. These determinations are valuable, however, as means of testing the efficiency of different methods for the purification of water. In a few cases particular diseases have, with more or less probability, been traced to particular pathogenic organisms in drinking-water, or the chemical products which they form, and in such cases, as of epidemic cholera or typhoid fever, a bacteriological search for the specific cause of the mischief acquires, of course, very great interest. Experiments have also been made with a view to ascertain the greater or less fitness of a particular water to sustain or to cause the disappearance of particular microbic organisms intentionally introduced by the experimenter.

Sanitary Inspection of Sources of Water-supply.—Apart from or side by side with laboratory examination, and guided in part by the indications its results afford, there should always be made a careful inspection of the sources of a water-supply, and of the channels by which it reaches the consumers, taking note of all dangerous contamination, actual or possible. The necessity for this becomes greater as population is more dense and the conditions of life more complicated. Particular attention should be given to any drainage reaching the water from kitchen-sinks, garbage and manure piles, stables and cow-pens, privies and water-closets (above all, during epidemics of disease affecting the digestive organs), leaky sewers, or sewers discharging into streams, heavily manured land in cultivation, cemeteries, slaughter-houses, tanneries, flax and hemp steeping-grounds, and factories producing large quantities of easily decomposable organic refuse, such as paper-mills (especially those working up wood-pulp), starch and glue factories, etc. In such an inspection questions of difference of level have to be considered, as bearing upon the direction taken by drainage; thus the top of a well may lie so high as to be safe from contamination from a given source, and yet the bottom of the shaft may be dangerously polluted from such source by underground filtration. In tracing possible underground channels of communication use has been advantageously made of soluble substances thrown into water at one point and admitting of easy detection at another. Thus a very small quantity of the substance known as uranine will communicate to a large body of water its peculiar fluorescent green color, which will be easily recognized if the water emerge elsewhere. Lithium chloride, readily detectable by the spectroscope, has also been proposed for this purpose. In the celebrated case of the Lausen (Switzerland) epidemic of typhoid fever in 1872, the use of a large quantity of common salt established the fact of a subterranean channel connecting two points about a mile apart and lying on opposite sides of a mountain.

Artificial Purification of Water for Human Use.—The purification of water by distillation as practiced in chemical laboratories is too tedious and expensive to be generally available on a large scale, but is occasionally resorted to under special conditions. Thus on board seagoing steamships fresh water is obtained by condensing the steam from the boilers, and a portion of it, rendered palatable by aëration, is supplied for drinking and washing purposes to the crew and passengers. Artificial ice-factories use distilled water to be frozen; it is often employed for the preparation of "soda-water" and other effervescent beverages, and in some cities distilled and aërated water is sold in limited quantities to those who are specially cautious as to the purity of the water they drink. Partial purification is brought about by freezing, so that the ice formed in Arctic regions from sea-water when melted yields water practically fresh and fit

to drink. But in water polluted by decaying organic matter the purification is not sufficiently complete for safety, and microbes retain their vitality after exposure to temperatures much below the freezing-point. The most important methods in use upon a large scale aim chiefly at clarifying the water from suspended solid particles—mineral silt, finely divided organic matter, and living organisms—either by subsidence, filtration, or precipitation; at "softening" the water by removal of calcium and magnesium salts; at destruction of organic matter by oxidation; or at "sterilizing" the water by destroying the vitality of living bacterial or other organisms. These results may be attained separately or, to some extent, together.

Purification by Subsidence.—This has already been referred to in connection with the natural clearing of river-water in the larger and more slowly moving portions of large rivers, and in the expanded basins of fresh-water lakes, as also in the larger storage-reservoirs provided by engineering work for the water-supply of cities. Such reservoirs are necessary adjuncts of the arrangements for precipitation, to be mentioned presently.

Purification by Filtration.—The porous materials used for the construction of filters vary, partly with the scale on which they are to be applied and partly with the special conditions of application. For small domestic filters fine siliceous sand, porous sandstone of natural or artificial origin, asbestos, siliceous infusorial earth, vegetable or animal charcoal, and spongy iron are among the most extensively adopted substances. Sponge, paper, and other organic materials are to be deprecated as furnishing the basis for decay in the filter itself. The most effectual clarification is brought about by the use of the Chamberland-Pasteur filters of unglazed porcelain or other fine earthenware; these at first entirely remove even bacteria, but their action is slow, and soon becomes much slower, and after a time bacterial organisms make their way, seemingly by *growth*, through the fine pores, though the filter can be re-sterilized by heat. Domestic filters are variously constructed; in some the water, in moderate quantity, passes through merely by its own weight; in others pressure, as, for example, the "head" of water in a system of city pipes, is used to force it through. It should never be forgotten that all filters require careful, periodical cleaning, often aided by a reversal of the current of water through them, and that the filtering material must after a time be renewed. If these precautions be neglected, filtration may become a source of increase rather than diminution of pollution.

On the larger scale sand is the material chiefly used, natural sand-beds being sometimes utilized. Brick tanks are constructed, often of an acre or more in area and several feet in depth. Broken stone is placed at the bottom of these, over drains for drawing off the water, and upon this layers of coarse gravel, fine gravel, and, on top, 3 or 4 feet of fine siliceous sand. The water is allowed to stand to the depth of 1 to 4 feet over the sand. The rate of filtration should be slow, generally not more than 2½ or 3 gal. an hour for each square foot of area. The efficiency of these filters, especially in the removal of microbes, is at first much increased by the formation of a slimy deposit on the upper surface of the sand, but later on the filter becomes so clogged that the rate of filtration is too slow for practical purposes. Hence periodical cleaning becomes necessary. The foul upper part of the sand is removed, water is introduced from below to effect an upward washing of the lower layers, and when the sand layer becomes too thin fresh sand is supplied on top. Spongy metallic iron has been used in some filters, but soon becomes clogged by oxidation, and is with difficulty kept in efficient condition. In cold weather large filtering-tanks may give trouble from freezing; under such circumstances covered tanks or more rapid filtration under increased pressure may be resorted to.

Purification by Precipitation.—Various saline substances, when added to turbid water, cause a more rapid deposition in the form of sediment of whatever suspended particles may be present. Even the common salt in sea-water acts in this way. Alum is thus employed, being added generally at the rate of from 2 to 5 grains, sometimes not more than half a grain, to the gallon. As the aluminium hydroxide, thrown down by carbonates in the water, has much to do with rapid sedimentation, it appears still better to add simultaneously alum and sodium aluminate. It is extremely desirable that no more be used than is absolutely necessary, so that no aluminum compounds remain in the clarified water. Iron chloride (ferric chloride) in very small quantity may be applied to the same purpose. The Anderson process has been successfully employed at Antwerp; it consists in passing the water slowly through revolving cylinders partly filled with iron borings. Ferrous carbonate in small quantity is formed and dissolved, and this by subsequent exposure to the oxygen of the air forms ferric hydroxide, which deposits in a flocculent state, carrying down with it the suspended matter of the water and materially reducing the amount of organic matter and of microbes. The application of any precipitating material requires, of course, to be followed by subsidence or filtration for the removal of the sediment formed.

Purification by Removal of Calcium and Magnesium Salts.—In 1841 it was first proposed by Dr. Thomas Clark, of Aberdeen, to get rid of the "temporary hardness" of water, due to calcium and magnesium carbonates held in solution by carbonic acid, by adding lime-water or milk of lime in quantity just sufficient to combine with the carbonic acid to form calcium carbonate; this, being insoluble in water, precipitates, and at the same time the original calcium and magnesium carbonates of the water treated, deprived of the solvent carbonic acid, precipitate also, the united precipitate being afterward removed by subsidence or filtration. The softening of hard water by this process is particularly valuable when it is afterward to be employed for certain industrial purposes. If to the lime-water there be added a carefully regulated quantity of sodium hydroxide, or if sodium carbonate and hydroxide be used together, "permanent" as well as "temporary" hardness may be removed. This may be made valuable in the purification of water to be used for raising steam, to avoid boiler incrustation. For the same purpose barium chloride is sometimes applied to the precipitation of calcium and magnesium sulphates when these salts are present in the water. For preventing steam-boiler incrustation a multitude of substances have been tried and are more or less used, which aim not at preventing the deposition of calcium and magnesium salts in the boiler, but at causing the deposit to form as a loose powder, easily removable, instead of producing a hard and adherent scale. Among such substances may be mentioned trisodium phosphate, paraffin oil, molasses, catechu, logwood sawdust, and tanbark. Many of those offered for sale are of very doubtful efficacy, and may even be considered positively mischievous.

Purification by Oxidation of Organic Matter.—Among solid oxidizing agents the most available for the removal of organic matter from water are the manganates and permanganates. Sodium manganate is now manufactured at a very moderate price for the disinfection of city sewage, and pure crystallized potassium permanganate may be employed under special circumstances, as in the exploration of specially unhealthful tropical countries, to diminish the risk of drinking-water contaminated by organic matter. The quantity required is small, and the right amount may be recognized by the pink color of the salt in solution ceasing to disappear when a minute excess has been added. The mixture used by the British troops in the Ashantee campaign of 1873–74 consisted of 1 part of calcium permanganate, 10 parts of aluminium sulphate, and 30 parts of fine clay, the last two being added to promote sedimentation.

The attempt has been made at several places, and with considerable success, to imitate artificially the natural action on organic matter of atmospheric oxygen in the so-called self-purification of rivers. Either air is sent through pipes in the storage-reservoirs, with numerous minute apertures for the gradual escape through the water of air in bubbles, or air is pumped into the distributing-pipes, becoming in them intimately mixed with the water under pressure greater than that of the atmosphere, so that when the water is drawn off for use it often appears for a short time milky, in consequence of effervescent escape of the surplus air in a very finely divided condition. Excellent results are reported as obtained with sewage, or water largely polluted by organic matter, by rapid filtration through gravel and sand, aided by the passage of a current of air.

Purification by Boiling, to Destroy Vitality of Microbes.—Great practical value attaches to the simple process of heating water intended for drinking, so as to bring it to active ebullition for a quarter of an hour or twenty minutes, allowing it to cool, and removing the "flatness" of taste by aëration, which may be brought about by passage through a porous filter (not to be also used for unboiled water). All, or all but the merest traces, of living organisms are destroyed by the boiling, and water originally suspicious or dangerous may be safely used for drinking. Of course, exposure to

microbe-laden air or dust might lead to the boiled water becoming again contaminated, so that it should not be kept too long on hand, and should be preserved in closed vessels. The method is chiefly applicable in a domestic way to small quantities of water, but arrangements have been devised by which larger quantities may be treated for the supply of barracks, hospitals, etc. It has been suggested that the dense population of China, living under conditions in many respects highly insanitary, may very probably owe its exemption from much disease that might be expected to prevail, to the general use of boiled water in the form of weak tea.

Influence upon Water of the Materiats used for its Storage and Conveyance.—Some considerations in regard to the materials of tanks, cisterns, and pipes used for storing and distributing water, and their effects upon the character of the water, may suitably close this article. Masonry cisterns should be built with the best hydraulic cement, so as not to give up any considerable quantity of lime to the water. Wooden cisterns and casks used for the storage of water are with advantage charred on the inside to the depth of something like a quarter of an inch. Boiler-plate iron serves well for the construction of water-tanks, as for use on board ships, and cast iron is the chief material used for the main lines of distributing-pipes, while smaller wrought-iron pipes are in part employed in the interior of buildings. The passage of water charged with atmospheric oxygen and carbonic acid through iron pipes is apt to lead to solution of enough of the metal, as ferrous carbonate, to cause tea made with the water to be blackened, clothes washed with it to be stained yellow, and sometimes a perceptible chalybeate taste to be produced. Dipping the pipes, previously heated to black redness, into well-boiled coal-tar tends greatly to protect them, and the black, asphalt-like coating formed does not give a bituminous taste if the process is properly carried out.

An extremely convenient material, but one which more frequently than any other has been found to affect the wholesomeness of water, is lead, often used as sheet-lead to line wooden tanks, and still more commonly as lead pipe in distributing water in houses. Waters differ greatly as to the extent of their action upon lead, and the conditions of action have not been defined with entire clearness. In general, very soft water containing much dissolved oxygen, that containing organic acids or peaty matter, and that which is brought intermittently into contact with the metal, attacks it most; hard water, especially that containing sulphates in large proportion, is much less active. The continued use for drinking of water which has taken up lead into solution, to the extent of but $\frac{1}{10}$th or even as little as $\frac{1}{100}$th of a grain to the gallon, may give rise to the exceedingly serious symptoms of chronic lead-poisoning. It has been found advantageous to add to water found to attack lead notably a very small quantity of calcium or sodium carbonate, and it has been proposed to protect in some degree the surface of the metal by running through the pipes, when new, a strong solution of sodium sulphide, thus forming a film of insoluble lead sulphide, which may afterward change by oxidation to the likewise insoluble lead sulphate. Water which has stood for some time in the service-pipes is naturally most dangerous; hence when lead pipes are used at all for the conveyance of drinking-water, care should always be taken to allow the water to run to waste for a time on opening a stopcock before collecting the portion to be used. Block-tin pipes are quite harmless and by far the best substitute for those of lead, but are expensive. An ingenious process has been invented for making lead pipe lined with tin, but it is not easy in making connections to insure the protection of the whole surface of the interior by tin. Zinc is also attacked and dissolved by many natural waters, especially when they come in contact with iron superficially coated with zinc (so-called "galvanized iron"). Copper, either alone or as brass (an alloy of copper and zinc), is acted upon, though in general slowly, the action being much promoted by the presence also of air. Soluble compounds of both zinc and copper must be counted among the deleterious impurities of drinking-water.

Various other materials—such as stoneware, glass, glass-lined iron, "enameled" iron, gutta-percha, and paper soaked with asphalt—have been, to a limited extent and under special conditions, used for the storage or conveyance of water, but can not be considered generally available for such use.

AUTHORITIES.—Among the works which may be consulted with advantage in reference to some of the aspects in which water has been considered in this article are the following: Tyndall, *The Forms of Water* (London, 1872); Dove, *Der Kreislauf des Wassers auf der Oberfläche der Erde* (Berlin, 1873); Dittmar, *Report on the Composition of Ocean Water* (1884, reports H. M. S. Challenger expedition); Reports of English Rivers Pollution Commission (London; especially the Sixth Report); Report of Royal Commission on Water Supply (London, 1869); Reports of State Board of Health of Massachusetts on Water Supplies (1887–90); Nichols, *Water Supply considered mainly from a Chemical and Sanitary Standpoint* (3d ed.); Bolton and Frankland, *Collection, Storage, Purification, and Examination of Water* (Chatham lectures, London, 1886); Fischer, *Das Wasser, seine Verwendung, Reinigung u. Beurtheitung* (2d ed. Brunswick, 1891); Guichard, *L'Eau dans l'Industrie* (Paris, 1894); Guinochet, *Les Eaux d'atimentation; épuration, filtration, stéritisation* (Paris, 1894); Frankland, *Water Analysis for Sanitary Purposes* (London, 1890); Wanklyn, *Water Analysis* (5th ed. London, 1879); Mallet, *Report on Chemical Methods for the Determination of Organic Matter in Potable Water* (Annual Report of U. S. National Board of Health, Washington, 1882); Leffmann and Beam, *Examination of Water for Sanitary and Technical Purposes* (2d ed. Philadelphia, 1891); Miquel, *Manuet d'Analyse bactériologique des Eaux* (Paris, 1891); Frankland and Ward, *First Report to the Water Research Committee of the Royal Society on the Present State of our Knowledge concerning the Bacteriology of Water* (London, 1892); Fanning, *Practical Treatise on Water Suppty Engineering* (New York); and Thorpe, *Dictionary of Applied Chemistry* (London, vol. iii., article *Water*).

J. W. MALLET.

Water-bear: See TARDIGRADA.

Water-beetle: any representative of two families of beetles which live in fresh water—the DYTISCIDÆ (*q. v.*) and *Gyrinidæ*. These two families, although distinct, agree in these respects: the beetles belonging to them have the body oval and depressed, the first ventral segments visible only at the sides, the legs of the second and third pairs flattened and fitted for swimming.

The *Gyrinidæ* are beetles "of an oval form, somewhat attenuated at their end, usually of a brilliant bluish-black color above, with the punctures reflecting a golden tint"; the prothorax has the prosternum short and carinated, and the episterna and epimera are distinct; the abdomen has seven segments; the eyes are completely divided by the margin of the head; the antennæ are inserted under the sides of the front, behind the base of the mandibles, and are short and thick, the "anterior legs very long, and received in oblique grooves of the pro- and mesosternal segments; tibiæ slender, with one terminal spur"; the middle and posterior legs are short, broad, and much compressed. The beetles of this family associate in groups, and are more generally known by their peculiar habits. In the proper season and place they abound, and move rapidly in whirl-like motion on the surface of the water, and, if disturbed, suddenly dive to the bottom. This habit of gyrating has obtained for them the name of whirligigs. See Leconte's *Classification of the Coleoptera of North America*. E. A. BIRGE.

Water-boatmen: hemipterous insects of the family *Notonectidæ*. These have a boat-like supinate form, the rostrum is free, the antennæ concealed beneath the eyes and four-jointed, and the posterior pair of legs have the coxæ very slightly movable in a longitudinal direction and longitudinally grooved, and the other joints are elongated and provided with a ciliated fringe, which enables them to swim rapidly through the water. Representatives of the family occur very generally in pools, etc. They are good divers, and also fly readily. They often collect around electric lights in such numbers as to be called electric-light bugs. Their eggs are laid in spring, and are attached mostly to the stems and leaves of aquatic plants. The young are comparatively broad and flattened. Revised by E. A. BIRGE.

Waterboro: town (incorporated in 1787, settled in 1789); York co., Me.; on the Portland and Rochester Railroad; 4 miles N. of Alfred, 28 miles S. W. of Portland (for location, see map of Maine, ref. 11–A). It contains the villages of Waterboro, Waterboro Center, North Waterboro, East Waterboro, South Waterboro, and Ossipee Mills, 2 churches, 3 hotels, manufactories of lumber, and an apiary for breeding Italian bees and queens. Pop. (1890) 1,357; (1900) 1,169.

Waterbury: city; New Haven co., Conn.; on the Naugatuck river, and the junction of the Naugatuck and High-

land divisions of the N. Y., N. H. and Hart. Railway; 21 miles N. by W. of New Haven, 33 miles S. W. of Hartford (for location, see map of Connecticut, ref. 10–F). It owes its origin as a manufacturing center to the Naugatuck river and several smaller streams that unite here, but these now provide a very small fraction of the power required by its manufactories. The business of making metal buttons was begun here 100 years ago, and for a long time the making of brass and German silver and of articles made therefrom was, in the U. S., confined to this city. The census of 1890 showed that 219 manufacturing establishments reported. These had an aggregate capital of $17,682,921, employed 10,354 persons, to whom $5,608,654 was paid in wages, used materials that cost $8,715,921, and had an output valued at $17,712,829. Of the total capital, about $10,000,000 was invested directly in the manufacture of brass and German silver, and of goods made therefrom. Waterbury is called the Brass City, and its buttons, plated ware, clocks, and watches are known all over the world.

The city has two reservoir water-supply systems, which have cost nearly $1,000,000, by one of which water is brought from the hills in the southeast part of Litchfield County, 11 miles distant; also electric lights, electric street-railway, public park, board of trade, 4 national banks with combined capital of $1,000,000, 3 savings-banks, a private bank, and 3 daily and 6 weekly newspapers. There are 23 churches, viz., Roman Catholic, 6; Methodist Episcopal, 5; Baptist, 3; Congregational, 3; Protestant Episcopal, 3; Lutheran, 2; and Second Advent, 1; and 3 chapels. The graded public schools number 16, employ nearly 190 teachers, and cost for maintenance over $170,000 a year. There are nearly 12,000 children of school age, and public-school property is valued at $650,000. A new high-school building was completed in 1895, at a cost, with site, of $130,000. Other educational institutions are St. Margaret's Diocesan School (Protestant Episcopal, chartered in 1875), Academy of Notre Dame, a large parochial school, and several private schools. The Silas Bronson Public Library, established on a bequest of $200,000 by the man whose name it bears, was opened to the public in 1870, and contains $60,000 volumes, for which a handsome building was completed in 1895. The city also contains a fine hospital, two theaters, a Masonic Temple, an Odd Fellows' Hall, a soldiers' monument, a costly drinking-fountain in the park, and an armory. Pop. (1880) 17,806; (1890) 33,202; (1900) town 51,139, city 45,859. C. F. Chapin.

Waterbury: town; Washington co., Vt.; on the Waterbury river, and the Cent. Vt. Railroad; 12 miles N. W. of Montpelier (for location, see map of Vermont, ref. 4–B). It contains the villages of Waterbury and Waterbury Center; has a Congregational, a Roman Catholic, two Free-will Baptist, and two Methodist Episcopal churches, a national bank with capital of $100,000, a graded school, the Green Mountain Seminary, and two hotels; and is principally engaged in the manufacture of boots and shoes, carriages and sleighs, leather, lumber, chimney-tops, and brick. Pop. (1880) 2,297; (1890) 2,232; (1900) town 2,232, village 2,810.

Water Cavy: See Capybara.

Water-clock: See Clepsydra.

Water-closet: a stool in which excremental matter is diluted with water and discharged into the soil pipe of a house. It consists of an earthenware basin to which water is brought by a pipe from a small tank, and is provided with a trap at the base. This trap keeps the gases of the soil-pipe from entering the house, and a vent-pipe should be attached to it on the lower side to prevent the water in it from being discharged by siphonage. The earliest form of water-closet which was extensively used was the pan closet. In this the matter was received in a metal pan which was tipped by means of a handle attached to a lever into a lower basin connecting with the soil-pipe. It was a very objectionable form owing to the difficulty of cleaning the lower basin, and has now gone out of use. The wash-out closet receives the matter in an earthenware basin, from which it is washed out into the trap by water entering around the upper rim of the upper basin. The hopper closet is the most approved modern form, the matter falling directly into the water which fills the trap; there being really but one compartment to the basin, it is more easily kept in good order than the wash-out closet. There are numerous kinds of both wash-out and hopper closets which vary in the special details. Automatic devices for discharging a water-closet are used to some extent. These are operated by the weight of the person upon a movable platform or movable seat to which is attached the mechanism necessary to discharge the tank. These devices are liable to get out of order and for a private house are not to be recommended. See Gerhardt's *Sanitary Plumbing* and Waring's *House Drainage*. See also Plumbing and Sewerage. Mansfield Merriman.

Water-color Painting: painting by means of color dissolved in water, some glutinous vehicle being combined with the color to fix it upon the surface to be painted. Fresco-painting is water-color and so is calcimining, such as is done upon ordinary walls and ceilings. The term is used especially for painting upon paper with colors prepared in advance by being carefully ground and mixed with gum. The colors are sold in hard cakes, in pans, and collapsible tubes. In the early stages of this art the solid cakes did not lend themselves to facile manipulation. The admixture of honey and glycerin with the colors, by keeping them soft, better meets the requirement of the artist for swift work, as in sketching. It has been held by some that opaque color such as has been got by mixing white with the paints is illegitimate, and is like a process of oil-painting. These critics hold that the lights in water-color should be got by the white paper showing through the work, which is to be kept as translucent as the pigments allow. The skill required by water-color artists is not inferior to that required by a painter in oil, but is in some respects different; thus there are some water-color artists who are not masters of oil-painting, and the reverse is also true. In fact, the artist in water-color requires greater swiftness and certainty of touch, and mistakes in drawing can not be corrected or covered over, as on canvas: the lines and the processes stand revealed. The ease with which the painter in water-color throws off sketches and produces startling effects with a few masses of light and shade, or a few bold gradations of tone, deludes many into the belief that this is a light and trifling branch of art. The method, in fact, is remarkably well suited to sketching, owing to the lightness of the materials and the rapidity with which the paper dries; the luminousness of the paper likewise greatly assists the immediate, superficial effect. But finished painting in water-color demands skill of a very high order; great works come only from masters, and no master has exhausted or even severely taxed the resources of the method. Its permanency seems to be unquestionable, though perhaps it is too early to pronounce a decided opinion on this point. Water-color paintings—not tinted drawings, which are very different things—have been known to retain their freshness and brilliancy for the space of ninety years, giving then no indications of weakness. The darkening of the paper on long exposure to the air may be partly avoided by protecting the surface with glass. The colors in other respects may be trusted to hold their own with even more certainty than is the case with canvas painting. The liability of paper to be torn renders the water-color painting less durable than the work on canvas, but this disadvantage reflects no disparagement on the method of applying color. True gems of art receive the greater care from being committed to fragile materials. And this care will be bestowed the more readily as it is a peculiar property of the paper on which water-color pictures are painted to retain and give back light, as may be observed by the luminousness of water-colors at dusk, when oiled canvas rapidly darkens. Societies of artists in water-color hold now a distinguished place among the schools of painting. The Belgian association, under the patronage of the king, is by some ranked first. In Great Britain there are two—the Royal Society of Painters in Water-colors, which was instituted in 1804 as the Society of Painters in Water-colors, but was not chartered till 1882, and the Royal Institute of Painters in Water-colors, founded in 1831. The French have paid less attention to water-color than the British, though individual artists owe their fame to it—e. g. Vibert and Detaille—and there is a Parisian Society of Water-color Painters. Artists of the Spanish school find it admirably adapted to produce the gorgeous effects they aim at. In New York the American Society of Painters in Water-colors was formed in 1867. Revised by Russell Sturgis.

Water Company: See the Appendix.

Watercourses: in law, streams of water which flow usually and between defined banks. They need not flow in a constant current or regularly throughout the year in order to have the character of watercourses, but must nevertheless be something more than mere torrents whereby the accumulation of surface water is carried off, perhaps always through the same channels or beds, but which soon become

exhausted and remain dry until the next supply from the rain or melting snow. So the watercourse is, on the other hand, to be distinguished from a mere percolation of water through underground strata of the earth or the drainage of surface water, however constant these may be, without being collected into a distinct current running between ascertained banks. A stream may have the character of a watercourse though it flow, throughout its course, in underground channels. The only point of difficulty in such a case is the ascertainment of the facts by which its character as a watercourse, as above defined, is determined.

It is only to such defined and regular watercourses, surface or subterranean, that the law of RIVERS and of RIPARIAN RIGHTS (*qq. v.*) has any application. Percolating waters, surface waters not collected in defined channels, and occasional or intermittent torrents are not subject to property rights, nor will any action lie for detaining or diverting such waters. G. W. KIRCHWEY.

Water-cress: See CRESSES.

Water-cure: See HYDROPATHY.

Water-dog: See MUD-PUPPY.

Water-feather: See FEATHERFOIL.

Water-ferns: See FERNWORTS (*Hydropterideæ*).

Water-flea: a name sometimes given to certain of the ENTOMOSTRACA (*q. v.*) and especially to the *Daphnidæ*.

Waterford: county of Ireland, province of Munster; bordering S. on the Atlantic. Area, 721 sq. miles. The surface is mountainous, several ranges from 2,000 to 3,000 feet high traversing it. The Suir and the Blackwater are the chief rivers. Pasturage and dairy-farming are the principal occupations. Coal, iron, lead, copper, and marble are found. Marble quarries are worked with success. Pop. (1891), 98,251.

Waterford: capital of the county of Waterford, Ireland; at the head of the tidal estuary of the Suir; 97 miles S. S. W. by rail of Dublin (see map of Ireland, ref. 12–H). It has a good harbor, with ship-building docks and a fine quay, to which vessels of 2,000 tons burden can ascend and unload. It contains fine streets; has good educational and benevolent institutions; manufactures flour, ale, and spirits, and carries on a considerable trade with England, exporting large quantities of agricultural produce. Pop. of the parliamentary borough, returning one member (1891), 27,623.

Waterford: town; Saratoga co., N. Y.; at the junction of the Hudson and Mohawk rivers, and on the Champlain Canal and the Del. and Hud. Railroad; 2 miles N. E. of Cohoes, 10½ miles N. of Albany (for location, see map of New York, ref. 4–J). It has abundant water-power, paper, flour, and knitting mills, boiler-works, foundries, soap and candle works, steam fire-engine shops, machine-shops, and other manufactories, library of School District No. 1, Union Free School, a private bank, and a weekly newspaper. Pop. (1880) 4,328; (1890) 5,286; (1900) town 6,157, village 3,146.

Water-gas: the mixture of hydrogen, carbon monoxide, and carbon dioxide gases which is produced by the contact of water or steam with carbon at the temperature of incandescence, or higher. It has been considered preferable, in practice, to heat the steam itself to as high a temperature as practicable, before contact with the carbon, by passing it through some superheating apparatus. The general result of this is to produce a mixed gas containing more carbon monoxide and less carbon dioxide, the latter gas being not only a useless but a detrimental constituent, as involving the consumption of lime (or other adequate purifying agent) in its removal from the gaseous mixture. It would appear that no temperature, however high, altogether prevents the formation of carbon dioxide; but the process has been conducted with such success as to involve the formation of but little, if any, more carbon dioxide than occurs in ordinary illuminating gas from gas-coal. If no carbon dioxide were formed, the reaction (supposing the carbon pure) should be as follows:

$$H_2O + C = H_2 + CO,$$

and the resulting gas would consist of equal volumes of hydrogen and carbon monoxide. More than one circumstance conduces, however, to prevent the volume of carbon monoxide from being equal to that of the hydrogen. One is the formation of carbon dioxide. Another is the presence of more or less iron pyrites in the carbon (which in America is always anthracite coal), the iron of which decomposes some steam without forming the equivalent of carbon monoxide. Another is the fact that no natural form of carbon (anthracite included) is free from hydrogen.

It must also be added that marsh-gas is probably a constant component of water-gas made from anthracite coal. The consequence of this is that water-gas, after purification to separate its carbon dioxide impurities, has been found to contain a proportion of carbon monoxide as small as 36 per cent., with about 56½ per cent. of hydrogen and 3½ of marsh-gas; the remainder, about 4 per cent., being nitrogen, which is derived from several sources.

Most of the experiments that have been made involving the preparation of water-gas—of which the most prominent in the U. S. have been by the different modifications known as the Gwynne-Harris, the Tessie-du-Motay, and the Lowe systems—have had as their object to produce a cheaper substitute for ordinary coal-gas for illuminating purposes; and the product is therefore usually combined with other gases made from gas-coal, petroleum, and the like. Its practical qualities and behavior under various conditions, and its peculiarities when handled in the way in which other gases are handled, on a large scale, are similar to those of other illuminating gases. It is produced in great volume and with great rapidity from comparatively compact apparatus, whose first cost is much less (per capacity of production) than that for ordinary coal-gas; and water-gas has therefore largely superseded coal-gas for heating and illuminating purposes.

Water-glass, also called **Soluble Glass**: a class of compounds of silica with alkalies which contain a sufficient proportion of the latter to confer solubility in water. The first formation of a definite compound of this kind has the composition $K_2O.4SiO_2$, and should contain very nearly 72 per cent. of its weight of silica. Fuchs's soluble glass is not deliquescent, and is insoluble in cold water; solutions made with boiling water, when strong and pure, are sirupy in consistence, transparent and colorless, and of specific gravity 1·25 or higher. The material is insoluble in alcohol, and the latter decomposes it when in aqueous solution, precipitating a silicate which contains twice the amount of silica corresponding to the above chemical formula. One of the most important adaptations of soluble-glass solutions is in the making of cement compositions and artificial stone. When brought into contact with lime or calcium carbonate or sulphate, insoluble, hard, glassy calcium silicates are formed, and this fact has been extensively applied, not only in hardening the surfaces of artificial-stone compositions, but in compounding the whole mass thereof. Other applications of water-glass are as a detergent, as a dressing for textile fabrics, for reducing the explosiveness of guncotton, for some surgical applications, as a cement for broken glass and porcelain, and even as a substitute for common glue. See GLASS. Revised by IRA REMSEN.

Water-hen: another name for the MOOR-HEN (*q. v.*).

Water-hog, or **Water-cavy**: See CAPYBARA and HYDROCHŒRIDÆ.

Waterland, DANIEL, D. D.: divine and controversialist; b. at Wasely, Lincolnshire, England, Feb. 14, 1683; studied at Magdalene College, Cambridge; became a fellow (1704) and master (1713) of that college; took orders in the Church of England; was appointed chaplain to George I. 1714; delivered the Lady Moyer lectures at St. Paul's, London, 1720; became rector of Ellingham 1713, and of the united parishes of St. Austin and St. Faith, London, 1720; chancellor of York 1723; canon of Windsor 1727; vicar of Twickenham and Archdeacon of Middlesex 1730; was highly distinguished as a Trinitarian controversialist. D. in London, Dec. 23, 1740. He has been called the last of the great patristic scholars of England. Among his writings were controversial treatises on the *Divinity of Christ*, against Drs. Daniel Whitby and Samuel Clarke (1718–24), in vindication of the authority of Scripture, against Middleton and Tindal, and on the doctrines of the Eucharist and baptismal regeneration, against the laxer divines of the Anglican body; and a critical essay on the Athanasian Creed, which he traces to Hilary of Arles. A complete edition of his *Works*, with a *Memoir*, was published by Bishop W. Van Mildert (11 vols., Oxford, 1823–28; 3d ed. 6 vols., 1856). Revised by S. M. JACKSON.

Water-lily Family: the *Nymphæaceæ*; a small group (thirty-five species) of herbaceous, aquatic, choripetalous dicotyledons, natives of all temperate and warm climates. The sepals are three to five, petals three to many, stamens

six to many, and ovaries three to many, free, or united into a compound pistil. The stems are creeping and submersed and the leaves mostly peltate, long-petioled, and floating. Fourteen species are North American. The white water-lily (*Castalia odorata*, Fig. 1) is common in the Eastern U. S. A

Fig. 1.—White water-lily (*Castalia odorata*), one-half natural size.

near relative (*C. tuberosa*) occurs more abundantly in the Mississippi valley. The lotus, water-chinquapin, or yellow nelumbo (*Nelumbo lutea*, Fig. 2), occurs in the waters of the

Fig. 2.—Lotus or water-chinquapin, one-fifth natural size.

Mississippi valley. It is curious on account of its large top-shaped receptacle, in the cavities of whose upper surface the

Fig. 3.—Victoria water-lily (*Victoria regia*), $\frac{1}{25}$th natural size.

pistils are imbedded (Fig. 2, at the left). The common yellow water-lily, or spatter-dock (*Nymphæa advena*), has smaller, yellow flowers with fewer petals. It is widely distributed in the U. S. The Victoria lily (*Victoria regia*, Fig. 3), the largest of all, occurs in the waters of the Amazon region of South America. Its peltate leaves are 6 to 10 feet in diameter, with an upturned margin 2 inches in height. Its flowers are from 10 to 15 inches in diameter, pinkish and fragrant. The starchy seeds are eaten by the natives. It is now grown in the parks and public gardens of many cities of the U. S., and flowers in the open air as far north as Washington. CHARLES E. BESSEY.

Waterloo: a suburb of Berlin, the county-seat of Waterloo County, Ontario, Canada (see map of Ontario, ref. 4–C). It has a large trade, good water-power, and thriving manufactures. Pop. (1881) 2,066; (1891) 2,941—nearly all Germans.

Waterloo: a thriving town, the *chef-lieu* of Shefford County, Quebec, Canada; near the center of the Eastern Townships, and having railway connection with Montreal by the Central Vermont Railway (see map of Quebec, ref. 6–C). The Canadian Pacific Railway has a branch running through the town. The trade of the place consists in the export of farm produce and such manufactured goods as leather, furniture, carriages, and woolen stuffs. Pop. (1881) 1,617; (1891) 1,733. J. M. HARPER.

Waterloo: city (founded in 1818); capital of Monroe co., Ill.; on the Mobile and Ohio Railroad; 22 miles S. of St. Louis, Mo. (for location, see map of Illinois, ref. 9–C). It is in a wheat and corn growing region; has a quarry of fine building-stone known as Waterloo marble, public-school building, St. Joseph's Academy (Roman Catholic), a State bank with capital of $25,000, a private bank, and 2 weekly newspapers; and contains 2 flour-mills, 2 soda-water factories, marble-works, large brewery and bottling-works, and ice-factory. Pop. (1880) 1,802; (1890) 1,860; (1900) 2,114.
EDITOR OF "REPUBLICAN."

Waterloo: town (founded in 1857, incorporated in 1864): De Kalb co., Ind.; on the Cedar creek, and the Lake Shore and Mich. S. Railway; 28 miles N. of Fort Wayne, 79 miles W. of Toledo (for location, see map of Indiana, ref. 2–G). It is in an agricultural region, is an important shipping-point for general produce, and has a graded high school, 7 churches, 2 private banks, and a weekly newspaper. Pop. (1880) 1,376; (1890) 1,473; (1900) 1,244.
EDITOR OF "PRESS."

Waterloo: city; capital of Black Hawk co., Ia.; on the Cedar river, and the Burl., Ced. Rap. and N., the Chi. Gt. W., and the Ill. Cent. railways; 93 miles W. of Dubuque, 297 miles W. of Chicago (for location, see map of Iowa, ref. 4–I). It is in an agricultural region; derives excellent power from the river for manufacturing; has gas and electric-light plants, water-works, street-railway, 2 private banks, and 2 daily, 5 weekly, and 4 monthly periodicals; and contains several flour-mills, foundries, carriage-factories, agricultural-implement works, railway machine-shop, well-drilling machinery-works, gasoline-engine factories, and sash, door, and blind factories. Pop. (1880) 5,630; (1890) 6,674; (1900) 12,580. EDITOR OF "COURIER."

Waterloo: village; one of the capitals of Seneca co., N. Y.; in the towns of Waterloo and Fayette, on both sides of the Seneca river and the Cayuga and Seneca Canal, and on the N. Y. Cent. and Hud. River Railroad; 17 miles W. of Auburn, 58 miles E. of Rochester (for location, see map of New York, ref. 5–F). It contains several large woolen, flour, and saw mills, wheel, wagon, and piano factories, union public school with library, a national bank with capital of $100,000, and a State bank with capital of $25,000; and has two weekly newspapers. Pop. (1880) 3,893; (1890) 4,350; (1900) 4,256. EDITOR OF "OBSERVER."

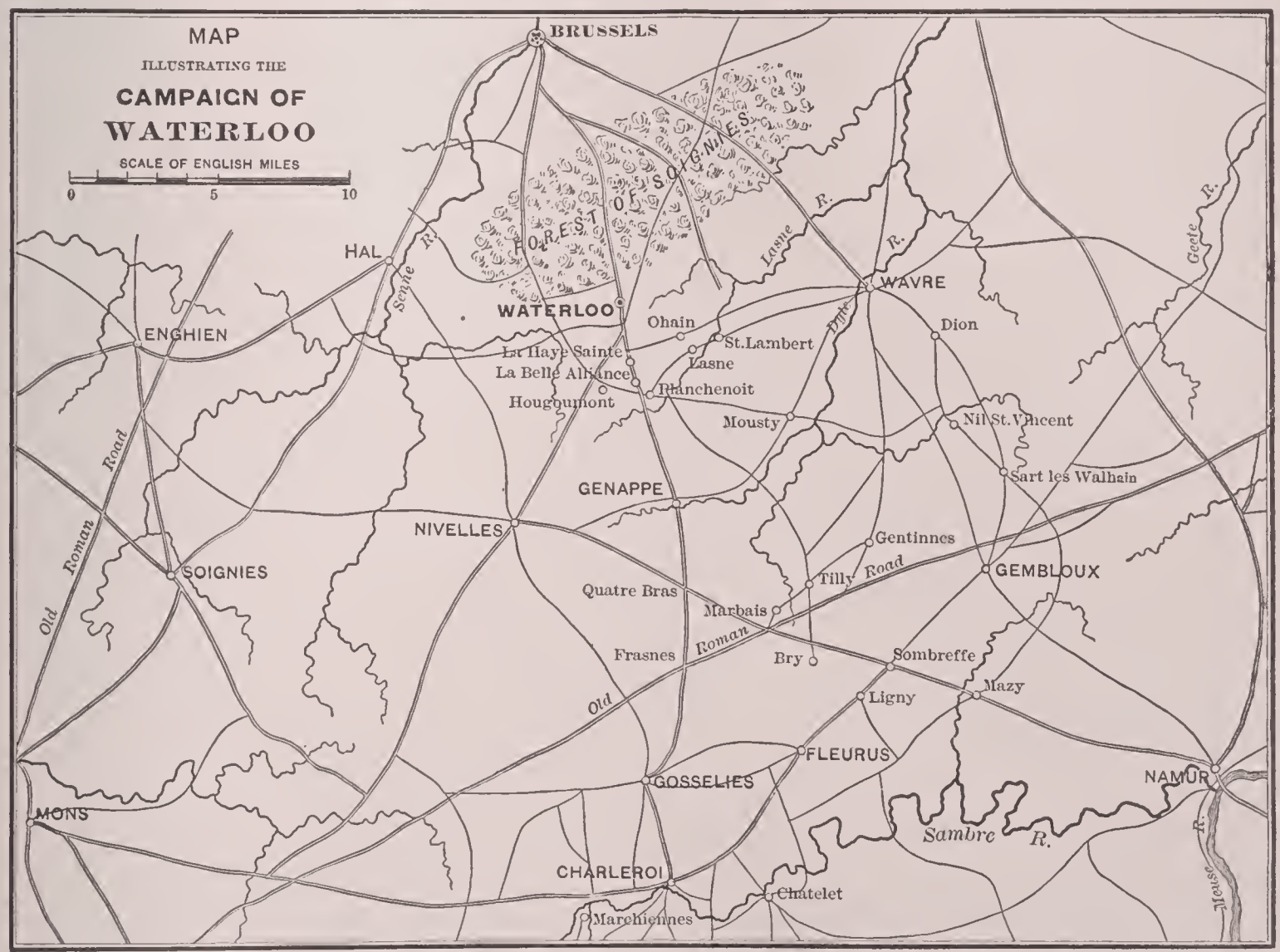
Waterloo, Battle of: one of the most important military engagements in all history, fought June 18, 1815, between the allied forces of Great Britain, the Netherlands, and Prussia on the one hand, and France on the other. The battle was the culmination of the campaign resulting from the escape of Napoleon I. from his exile at Elba.

The Hundred Days.—Napoleon, on his return from Elba, reached Paris on Mar. 20, 1815. The great powers, whose representatives were then in session at Vienna, at once agreed to unite for his final overthrow, and the forces of Great Britain, together with those of the Netherlands and Brunswick, were placed in command of the Duke of Wellington, the Prussians were united under Field-Marshal Blücher, and the forces of Austria and Russia were to be commanded by

Prince Schwarzenberg. Napoleon decided to strike his blow before the enemy was ready to receive him, but wished to postpone the movement as long as possible in order to gather his forces. He judged that 800,000 men would be necessary to defend his recovered empire, and as early as June 1 there were 560,000 men on the rolls. Charras has shown, however, that at that date there were really only 198,000 troops in condition for active service.

Plan of Campaign.—Napoleon kept himself fully informed through private sources of the movements of his enemies. Though by guarding the frontier with the utmost strictness he endeavored to keep his own plans a secret from the enemy, it afterward appeared that he had not been completely successful. The Prussians under Blücher, with headquarters at Namur, were the first to be ready for action. Of this Napoleon was fully aware, and accordingly he decided to strike a decisive blow before Wellington could come to the support of his ally. The line occupied by the two armies of Wellington and Blücher on the 10th of June may be roughly described as extending about 150 miles from Ostend, on the channel, through Brussels, to Liège, in the eastern part of Belgium. The headquarters of Wellington were at Brussels. Napoleon very naturally attached not a little importance to the fact that Wellington's army depended upon the channel ports for its supplies, while the supplies of the Prussians must come from the Rhine; for either army in case of defeat would naturally, Napoleon thought, fall back toward its base, and thus the two forces would be driven farther apart. Napoleon's plan of operations seemed to be invited by the fact that a great turnpike which furnished admirable facilities for the movement of an army extended from Brussels almost due S. to the French frontier. Wellington's army was entirely W. of this road, while Blücher's was entirely E. of it. But Wellington believed that the emperor would strike the blow at the N. W. for the purpose of cutting off the British and Dutch from their line of supplies. Ever afterward, as his *Memorandum* of 1842 shows, Wellington believed that Napoleon might have attacked at that point with greater chance of success. It was this belief which led the British commander, even up to the hour when the French crossed the frontier, to keep his forces distributed at points convenient for immediate concentration either at the western or at the eastern end of the line. Wellington has often been criticised for this extension of his forces, but it would seem that a sufficient answer to this criticism is found in the fact that when the attack came he was able to concentrate his troops in time to frustrate the advance at Quatre Bras, upon which so much depended.

The Number and Position of the Forces.—At the beginning of the campaign the Prussian force under the command of Blücher consisted of four corps: the first, under Ziethen, of 32,692 men, stationed at Charleroi; the second, under Pirch, of 32,704 men, at Namur; the third, under Thielmann, of 24,456, at Ciney; the fourth, under Bülow, of 31,102, at Liège; constituting a total, including 3,120 wagoners, of 124,074 men. This force consisted mainly of veterans, even the youngest of them having seen hard service in 1813 and 1814. Blücher's corps commanders were all experienced officers, though Bülow was the only one of them who had ever before had an independent command. Wellington's force was a motley collection made up from different nationalities and speaking different languages. The number of the British troops was 31,253; of the king's German legion, 6,387; of Hanoverians, 15,935; of Dutch-Belgians, 29,214; of Brunswickers, 6,808; of the Nassau contingent, 2,880; of engineers, etc., 1,240; making a total of 93,717, of whom 69,829 were infantry, 14,482 cavalry, and 8,166 artillery. The force was grouped into two corps, the first, of 25,233, commanded by the Prince of Orange; the second, of 24,033, by Lord Hill; while the reserve, of 20,563, and the cavalry and artillery were under the more immediate direction of the duke himself. The commanders of this motley army, and even the subordinate officers, were men of large military experience, though the army as a whole was declared by the duke to be the poorest he had ever led.



Until the blow was struck Wellington deemed it necessary to guard the approaches by Lille and Ath, and by Mons and Hal, and consequently his first corps was stationed about Mons, Enghien, and Nivelles, while his second was distributed at points as far W. as the Scheldt. The reserve was held in the vicinity of Brussels. The French army was organized in five corps, besides the reserve. The first corps,

d'Erlon's, had 19,939 men; the second, Reille's, 24,361; the third, Vandamme's, 19,160; the fourth, Gérard's, 15,995; and the sixth, Lobau's, 10,465. Besides these, the Guard contained 20,884, and the reserve 13,784, making a total fighting force of 124,588 men. Of these, 89,415 were infantry, 23,595 cavalry, and 11,578 artillery, with 344 guns.

Napoleon decided to concentrate his army on the French frontier a few miles S. of Charleroi, and to this end the first and second corps were sent to Solre, about 8 miles S. W. of Charleroi, the third to Philippeville, and the fourth and sixth, with the reserve, to Beaumont. These positions offered good roads to the point of crossing the Sambre at and near Charleroi, about 8 miles away. Though the Prussian army had pushed its line S. of Charleroi, the concentration of the French at the three points named was so quietly and successfully accomplished that on the evening of June 14 Napoleon believed his movements had been unobserved. But in this he was in error, for as early as the evening of the 13th Ziethen had reported to Blücher the gathering of two great camps at Solre and Beaumont, and had received orders in return to send heavy baggage back to Gembloux. On the evening of the 14th Blücher received further reports, whereupon he ordered Ziethen to fall back and hold Fleurus, a village 7 miles N. of Charleroi. At Wellington's headquarters it was also understood that the enemy was approaching. Müffling, then with the duke, says that "on the 13th and 14th it was positively known that the enemy was concentrating in the neighborhood of Maubeuge." On the evening of the 14th, Napoleon himself, who had just arrived from Paris and established headquarters at Beaumont, sent to all the regiments one of those stirring addresses he was accustomed to issue to his troops on the eve of a great battle. His orders were that all should be ready to move at 3 A. M. on the 15th.

Ligny and Quatre Bras.—Various causes delayed the movements of the French. Napoleon had supposed that his whole force would be across the Sambre at noon, but in fact when night came on a little less than 100,000 were N. of the river. A glance at the map will show that two great roads extend northward from Charleroi, the one running almost due N. through Quatre Bras and Waterloo to Brussels, the other running in a northeasterly direction through Fleurus and Sombreffe to Gembloux. These two roads are crossed at Sombreffe and Quatre Bras by the great turnpike leading from Namur to Nivelles and forming the most important line of connection between the allied armies. At a meeting of Wellington and Blücher as early as May 3 it was agreed that if Napoleon should cross at Charleroi, the utmost endeavors should be put forth to prevent his taking possession of either Sombreffe or Quatre Bras. Napoleon, on the other hand, was equally aware of the importance of securing one or both of these points. He met with a stubborn resistance, especially from the Prussians under Ziethen, who was slowly driven back contesting every point on the way. Ziethen held Fleurus at dark, but the most of his forces were already encamped on the slopes about Bry and Ligny. It was while Napoleon was near Fleurus that he was joined by Marshal Ney, who, in response to the emperor's call at the last moment, had just reached the army. Napoleon assigned his old marshal to the command of the left column, intrusting to him the great work of opening the road through Quatre Bras to Brussels. Ney, not having been with the army, was quite unacquainted with its organization, and the orders that had been given the corps commanders. He gathered the threads into his hands, however, as best he could, and in the course of the afternoon pushed forward through Gosselies to Frasnes, and finally to the vicinity of Quatre Bras. Here he met with a stubborn resistance by a brigade of Wellington's troops. It was now eight o'clock and nearly dark, and the French had been on the march for seventeen hours. Leaving his troops as he had brought them up, Ney returned to Charleroi, where he remained until two o'clock in the morning of the 16th with Napoleon.

Meanwhile the forces were gathering in the north for the contests of the morrow. Ziethen at daybreak of the 15th had sent a message to Blücher that his posts had been driven in, and Blücher at once issued orders to the corps of Pirch, Thielmann, and Bülow. Pirch reached Ligny at five, and Thielmann at eight on the morning of the 16th. The march of Bülow, however, was less fortunate. Stationed at Liège, he had received his orders at a later hour, and as the dispatch had not told him that the conflict had already begun, did not press forward with unusual haste. The consequence was that it was not till noon of the 16th that he reached Hannut, 25 miles from Ligny, although if his orders had been more explicit he might have arrived at Ligny in time to have saved the battle.

Wellington received the first news of Napoleon's advance at about three o'clock in the afternoon of the 15th at Brussels. He hesitated, however, to issue orders until he should receive further information, alleging as a reason that the French design was not yet sufficiently revealed. It is evident he feared the attack at Charleroi was designed merely to conceal a more formidable advance by way of Mons. It was therefore not until he had received further news in the evening assuring him directly from Mons that the enemy had turned his entire force against Charleroi that he issued two orders—the first to be in readiness, and the second to move the whole army to the left.

The delays that occurred on the part of the French on the morning of the 16th can be accounted for only by the supposition that Napoleon was entirely ignorant of the condition and situation of his enemies, and that his conjectures in regard to their movements and purposes were grossly erroneous. At six o'clock Grouchy reported to Napoleon that the Prussian army was deploying before Fleurus, where the corps of Ziethen had already been joined by that of Pirch. It was not until eight o'clock, after Thielmann's corps, having marched 15 or 18 miles from Namur, had joined the other Prussians, that Napoleon issued the orders for the day. He then formed the army into two wings, giving the right to Grouchy, the left to Ney, and keeping the reserves under his own more immediate supervision. The orders that he gave to Grouchy and Ney show that he had no adequate conception of what was before him. As if there were hardly more than a skirmish line of Prussians to be brushed aside, he ordered Grouchy "to march on Sombreffe and take up a position there." He was then "to send an advance guard to Gembloux and reconnoitre all the roads, especially that to Namur, establishing also communication with Marshal Ney." To Ney he writes in equally explicit terms. He says he will himself be at Fleurus before noon; that he will clear the road to Gembloux before three; that he will there decide what future course to pursue. His intention was to march on Brussels, and Ney was directed to be ready to start for Brussels in the evening.

Ney received the order between ten and eleven, but did not succeed in bringing up the scattered forces from the rear so as to begin the advance from Frasnes until between one and two. Wellington arrived on the field from Brussels at about eleven. The emperor was not ready to attack until two; but before ordering an advance he sent a note to Ney directing him to drive off vigorously what was before him, and then to wheel and assist in the annihilation of the Prussians. But although at first Ney made good progress and seemed for a time likely to secure the Namur road at Quatre Bras, the arrival of Picton at about three made all further advance impossible. At six Ney received a further dispatch from the emperor saying that the Prussians were hotly contesting their attacks, and calling upon him "to manœuver immediately in such a manner as to envelop the right of the enemy and fall upon his rear." Thereupon Ney called up all his reserves for another desperate attack. But Wellington's force had now been increased to over 30,000 men, and, feeling himself now superior to the enemy, the duke took the offensive and drove back the exhausted troops of Ney to Frasnes. Here the corps of d'Erlon, which by a misunderstanding had marched over to assist Napoleon and then turned back, came up just in time to prevent further pursuit by the allies.

This defeat of Ney at Quatre Bras compelled Napoleon to finish the battle of Ligny without his assistance. The desperate fight had continued about three hours, chiefly on the Prussian left, where Vandamme had attacked again and again without important results. At about half-past six, when the Prussians had become entangled in the indecisive results all along the line, the emperor ordered the Guard to charge upon the enemy's center. The furious onsets of the French pierced the Prussian line and threw it immediately into confusion. The French captured twenty-one guns, but darkness prevented pursuit. Blücher, who had fallen from his horse and been disabled, at this point turned over the command to Gneisenau, his chief of staff. In the course of the night Gneisenau decided upon a general retreat northward upon Wavre, and gave orders to start at daylight. By this movement Napoleon was completely deceived. Never thinking that the Prussians would abandon their source of supply at Namur, he assumed that they had retreated in that

direction. On the morning of the 17th he wrote Ney: "The Prussian army has been put to rout; Gen. Pajol is pursuing it on the road to Namur and Liège." It was the error of this supposition that made victory impossible on the following day.

Waterloo.—Napoleon, apparently quite satisfied with what had been accomplished on the 16th, did not leave his tent at Fleurus until late on the morning of the 17th. The Prussian troops, having started at about three o'clock, had already been more than four hours on the march. Ziethen and Pirch made their way due northward by narrow roads through Tilly and Gentinnes, while Thielmann, who had the reserves and a large part of the artillery and heavy wagons, took the better though longer road, through Gembloux. Bülow, who had learned of his mistake in delaying at Hannut on the morning of the 16th and had hurried along the old Roman road toward Ligny, only to find himself too late, received orders early on the 17th to turn from Gembloux to Wavre. At nightfall Ziethen and Pirch had their corps safe on the north side of the Dyle at Wavre, Thielmann was on the south side, and Bülow was at Dion, 2 miles to the southeast. Gneisenau in the course of the night sent word to Wellington of his line of retreat, but the messenger did not reach the headquarters of the duke at Quatre Bras until seven in the morning of the 17th. Wellington, on receiving assurance from Blücher that he would join him, began to fall back, and at night the 30,000 who had fought at Quatre Bras, united with about 42,000 others, slept upon the field which on the following day was to be made one of the most famous battle-fields of the world.

Early in the morning of the 17th Ney sent to Napoleon for instructions. In answer to this inquiry the emperor sent a letter containing the most explicit directions. Ney was ordered to concentrate all his forces near Quatre Bras and await further orders. He added: "To-day is required for completing this operation, filling up ammunition, and gathering stragglers and detachments." From this it was made evident to Ney that no general engagement was intended unless the allies should assume the offensive. The emperor after sending this letter reviewed the several divisions at Bry and at Ligny, and even took the time to address the Prussian prisoners at some length. At noon, hearing that Wellington was still at Quatre Bras, he directed Soult to send another letter to Ney in which he said: "The emperor has just placed in position before Marbais a corps of infantry and the Imperial Guard. His Majesty desires me to tell you it is his intention that you should attack the enemy at Quatre Bras and drive them from their position, and that the corps at Marbais should second your operations. His Majesty is going to Marbais and waits impatiently for your report." It was just after sending this letter that he called Grouchy to his side and intrusted to him a force of 33,000 men and orally directed him to pursue Blücher, "complete his defeat," and communicate constantly with the emperor by the Namur road. Grouchy expressed himself freely as to the difficulty of finding and defeating the Prussians, who had about eight hours the start. But the emperor insisted upon the marshal's doing his duty. At Marbais, however, Napoleon received information which shook his confidence that Blücher had gone to Namur, and sent, through the hand of Gen. Bertrand, positive instructions for Grouchy's guidance. He was to march on Gembloux and throw out exploring parties "to ascertain whether the Prussians were separating from the British or bent on uniting with them to save Brussels and try the fate of another battle." This letter, written about three o'clock, probably reached Grouchy not earlier than four, at the very time when a full half of the Prussian army was north of the Dyle at Wavre. After two o'clock it rained in torrents, and it was 10 P. M. when the rear of Grouchy's column bivouacked at Gembloux. It is worthy of note, moreover, that it was not until he reached this point that Grouchy was able to state positively that even a part of the Prussians had gone to Wavre. The reports indicated, however, that Blücher himself with one column had retired to Liège, and that one column had gone to Namur. At 2 A. M. he satisfied himself that the whole army had gone to Wavre; and accordingly, at that hour, he wrote to Napoleon that he should move in that direction early in the morning to prevent Blücher from uniting with Wellington for the protection of Brussels.

When Napoleon, leaving Marbais at about two o'clock, reached Quatre Bras, he found that Wellington's force had left before noon, and that Ney's army was still resting about the crossing of the Namur and the Charleroi roads. Napoleon's re-enforcements raised the army to 71,947 men and 240 guns. The French marched toward Waterloo and bivouacked in parallel lines only a few thousand yards from the enemy. Both armies were drenched during the night, as the downpour of rain did not cease until three or four hours after sunrise; but the French, nearly destitute of firewood, suffered more severely than the British.

Both the allies and the French were put under arms at an early hour. The French lines were drawn up in full view of the allies, and were purposely so disposed as to make the largest possible impression. The emperor went from division to division cheering the men and showing the utmost confidence in the issue of the day. Wellington was equally active. He gave his final directions to the various commanders, and then dispatched messengers to Blücher. Three contingencies were provided for: If Napoleon should attack the British right, the Prussians were to approach by way of Ohain for the purpose of meeting the two armies; if he should assault the center or the left, they were to advance by St.-Lambert and Lasne, and take the French on the right flank; if he should advance to St.-Lambert, Blücher was to meet him in front, while Wellington would attack vigorously in the rear. At half-past eleven the French began a cannonade and apparently were making preparations for an assault upon the center, but on account of the difficulty of moving the guns Napoleon decided to delay the forward movement until one o'clock. Before the advance began the head of Bülow's column had been a full hour in sight on the heights of St.-Lambert. Wellington knew that these were Prussians, but Napoleon could not be sure whether they were Prussians or Frenchmen.

But where was Grouchy? Leaving Gembloux at about the same hour that Blücher left Wavre, the head of his column under Vandamme had reached Nil St. Vincent, and Grouchy himself had reached Sart-les-Walhain, when, at half-past eleven, the roar of artillery in the west announced that the battle had begun. Napoleon had ordered Grouchy to find Blücher and follow him. The question now arose whether he should carry out his orders strictly or, on hearing the cannonade, wheel to the left, and by crossing the Dyle near Mousty attempt either to arrest the Prussians or to push on with all possible speed to Planchenoit. The question was discussed by Grouchy and his officers, some of whom warmly urged the latter movement. But the head of the column was 14 miles from Planchenoit, they would have for most of the way only a single narrow road, the mud was so deep that all movements must be exceedingly slow, the general of artillery protested that it would be impossible to reach the battle-field in time to be of assistance that day, and Grouchy decided to continue his march on Wavre. Whether he was right in this decision has been a matter of almost endless controversy among military critics. The head of Grouchy's column after the utmost endeavors did not reach Wavre until after two o'clock. Over a much worse road it could hardly have reached Mousty before half-past two or three. But at three the last of Bülow's column was passing St.-Lambert, and Pirch was approaching. St.-Lambert, moreover, is more than 5 miles nearer the battle-field than Mousty. From all this, it appears that it would have been impossible for Grouchy to interfere with the advance of Bülow, and probably impossible to arrest Pirch. But even if he had succeeded in reaching the second of the Prussian columns, Pirch and Thielmann, with their superior numbers, would at least have kept him back, and Bülow and Ziethen would have been left to pursue their way undisturbed. In view of these facts, it is not easy to see how Grouchy could in any way have influenced the result of the battle.

The first advance ordered by Napoleon at Waterloo was on the Château Hougoumont, at the left of the line, for the purpose of diverting attention from the more formidable attacks soon to be made on the right and the center. But the walls had been pierced with portholes by order of Wellington, and every assault was successfully repulsed. The attacking force was increased until it numbered about 12,000 men, and so persistently and wastefully was the effort kept up that very few of this force took any part in the assault on the main line of the allies.

Napoleon's plan was to make the main attack upon the center, for the purpose of taking possession of the high ground where the Wavre turnpike enters that from Charleroi. To prepare the way for the charge an enormous battery of seventy-eight pieces planted in front of the French lines had continued for an hour and a half to fire at a range

of less than a third of a mile into the allies lying across the pike at the junction of the Wavre road. The attack was to be made in four columns, so arranged that they were from twenty-four to twenty-seven ranks deep. This unusual arrangement proved to be unwieldy, and when the assault came tended only to confusion. The charge was led by d'Erlon, and at first swept everything before it. The Dutch-Belgian brigade fell back in confusion. The French reached the crest of the ridge, when Picton's division received them with so hot a fire, and then charged them with so much vigor that they were arrested and staggered. While they were trying to disengage their ranks Ponsonby's brigade of heavy cavalry charged them furiously, and, riding down between the columns, cut down the infantry right and left with such fury that the French, leaving two eagles and fifteen guns in the hands of the British, were obliged to withdraw in confusion. It was at this moment that Napoleon saw the Prussians approaching in such mass as to require his immediate attention. He decided to send the Sixth Corps to hold Blücher in check beyond Planchenoit. This necessity weakened his attacking line by about 16,000 men, making his available force now some 6,000 less than Wellington's.

The next movement was a reckless assault upon the farmhouse at La Haye Sainte, the walls of which were defended with the same vigor that had characterized the defense of Hougoumont. After vast numbers of officers and men had been sacrificed, the place was taken just before four o'clock. Napoleon now thought it necessary to give his own attention to the Prussians, who were striking at his flank and rear 1½ miles away. Meanwhile it had been decided to make the next great assault on the west of the Brussels pike. It was therefore determined to make the advance with cavalry. From four o'clock until six, Ney hurled the magnificent divisions of Milhaud, Lefèvre-Desnouettes, Kellermann, and Guyot in four successive assaults upon the British squares, but could not break through the lines.

While these events were going on Napoleon himself was occupied in defending his flank and rear against Bülow at Planchenoit. The Prussians drove back the Sixth Corps and took possession of the village; but the emperor, believing that his flank should be defended at all hazards, called in strong re-enforcements from the Old, the Middle, and the Young Guard, the very *élite* of the army. With the help of these he retook the town, and then, thinking the line was safe, returned to witness the results of Ney's charge. It was now seven o'clock, and Pirch was only 2 miles in the rear of Bülow. Ney, having no control over the Guard, had exhausted his resources, and an hour of lull gave Wellington time to reform his line.

The emperor now had before him the hard task of bringing his force into order for a final attempt to break the enemy's center. There were but eight battalions remaining that could be used against the allies. These, with such artillery as could be manœuvered for their support, were drawn up just at the left of the Brussels pike, and, after being addressed and appealed to by Napoleon, were given into the command of Ney. They were to advance by column diagonally across the field so as to attack the British center. As they advanced at quickstep, shouting *Vive l'Empereur*, all firing ceased. The heavy infantry, who were to receive them, lay flat upon the ground until the column was within 50 or 60 paces; Maitland's brigade, presenting a front of 450 men, were then ordered to stand up. The French suddenly halted. As they seemed to hesitate, Maitland's famous brigade sprang forward with the bayonet. The charge was supported by the allies with a vigorous fire on the flanks, and the French were forced back to their own lines with great slaughter.

It was at this time that the head of Ziethen's column reached the ground. Coming from Ohain, he approached the field opposite the space which divided the contending armies. The division of Steinmetz at once wheeled into position and began a furious attack upon the French, spreading terror and confusion throughout the right wing of the army. At this juncture the duke, seeing that the battle was won, ordered an advance along the whole line. The French gave way at every point. The emperor did what he could, but the troops were everywhere too much exhausted to make any determined resistance. Only one line of retreat was open. The army was crowded into a confused mass, and the Prussian cavalry took up the pursuit with such terrific vigor that at Genappe the French abandoned 100 cannon, and from that point made no attempt to preserve even the semblance of order. The army broke into confusion, and the flying troops, throwing away every incumbrance, made their way as best they could toward Paris. Napoleon himself left the field in the center of a square "with a somber, but calm countenance, his far-seeing glance probing futurity, and seeing that more than a battle had been lost on that day." Before sunrise he reached Charleroi, on the 21st he arrived at Paris, and on the 22d he presented his abdication.

The number of casualties to the French it is impossible to determine. Charras, who studied the matter, estimates the killed, wounded, and missing at between 31,000 and 32,000. The allied armies lost in killed, wounded, and missing, a total of 22,428. The losses of the British, Scott says, "threw half Britain into mourning."

AUTHORITIES.—The accounts of the campaign and battle written before a critical examination had been made of the dispatches were all very untrustworthy. Even the celebrated description of Thiers has been shown to abound in errors of the most fundamental and important nature. Alison's account, written from the British point of view, has also been entirely superseded. The two accounts of the campaign and battle given by Napoleon himself while at St. Helena, though important, are shown by the dispatches to abound in errors and misrepresentations. In some important points also they contradict each other. The most important modern works, written after a study not only of the original dispatches, but also of the memoirs of the officers who took part, are the following: Charras, *Histoire de la Campagne de 1815*; Chesney, *Waterloo Lectures* (London, 1868; 3d ed. 1874); Clausewitz, *Der Feldzug von 1815 in Frankreich*; Gardner, *Quatre Bras, Ligny, and Waterloo*; Hooper, *Waterloo, the Downfall of the First Napoleon*; Kennedy, *Notes on the Battle of Waterloo*; Müffling, *A Sketch of the Battle of Waterloo*; Ollech, *Geschichte des Feldzuges von 1815*; Quinet, *Histoire de la Campagne de 1815*; Siborne, *History of the War in France and Belgium in 1815*; and Ropes, *The Campaign of Waterloo* (New York, 1893). Those of Ropes, Gardner, and Chesney are the most valuable authorities in English. The fullest bibliography and the best maps are in Ropes. Gardner abounds in admirable notes, and has an interesting Appendix of "Waterloo Poetry." The highest value of Chesney perhaps is his merciless and irrefutable exposure of the mendacity of Napoleon, and the consequent worthlessness of such descriptions as those of Thiers and others that are founded on the emperor's representations. C. K. ADAMS.

Waterman, MARCUS: See the Appendix.

Watermelon: the fruit of the *Citrullus vulgaris*, a trailing annual vine of the family *Cucurbitaceæ*, a native of Asia and Africa, extensively found wild on the plains of the latter continent, where some varieties or specimens of its fruit are bitter and poisonous. Watermelons are largely grown in the U. S. for their cooling, watery pulp. In warm climates sugar has been profitably made from watermelons. About sixty different varieties are offered by seedsmen. A variety with hard, inedible flesh, the rind of which is used for preserves, is popularly known as citron.

Water-meter: an automatic device for measuring and registering the flow of water.

One of the most difficult problems in municipal engineering is to prevent wanton waste of the water supplied to the inhabitants at public cost. (For statistics illustrating the fact that great waste is prevalent, see WATER-WORKS.) The only mode of restraining such waste appears to lie in a system of charges based upon the quantity of water actually drawn by each consumer. Such a system of charges presupposes accurate means of determining the quantity of water drawn. The device made use of must be capable of registering the smallest as well as the largest quantity deliverable; it must work under all pressures from a few feet up to 200 or more; it must work for long periods without attention; it must not leak; it must be capable of standing idle or even of remaining dry without losing its efficiency; it must offer but slight resistance to the flow of the water; and, finally, since it must be applied in great numbers, it must be furnished at a moderate cost.

A leading type of modern water-meter is the disk meter. Figs. 1 and 2 show the principle on which the meter acts; 1 is a section on the line A B through the chamber of the meter, and 2 shows the meter in plan. The top and bottom of the chamber are formed by two conical surfaces, whose vertices meet at the center and whose axes coincide. They are joined by the vertical partition *c d* extending from the cen-

ter to the circumference. The circular wall of the chamber, uniting the outside edges of the cones, is a spherical surface. A slight enlargement of the chamber at g receives the admission-pipe k and the discharge-pipe l. A round ball is fitted in the center of the chamber, the cones and the partition being cut away to receive it. It fits watertight and is susceptible of a slight rotary movement. Through the center of the ball passes the disk $a\ b$, and at right angles to the disk is the spindle p. The disk exactly fits the interior of the spherical zone of the chamber. In the position shown the disk touches the upper conical surface in a line extending from e to the ball, and the lower one in a line extending from the ball to f, Fig. 2.

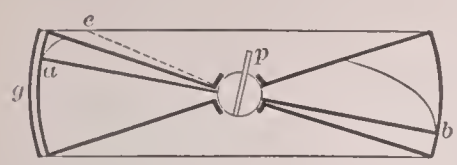


Fig. 1.

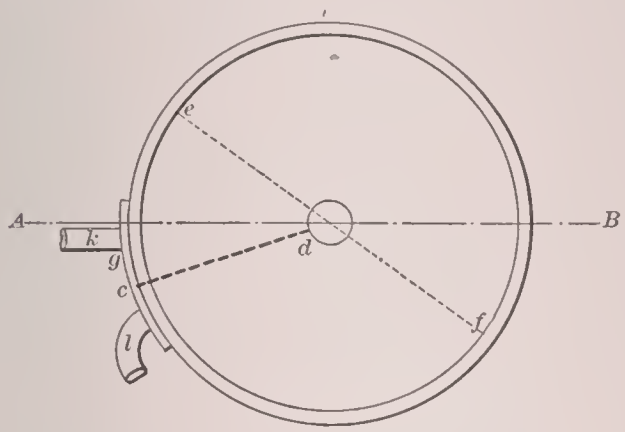


Fig. 2.

As shown in the figure, the portion of the chamber below the disk is divided into two parts, viz., the first, which is in communication with the supply-pipe, extends from the partition $c\ d$ to the line f; the second, which is in communication with the discharge-pipe l, extends from f to the partition. The upper part of the chamber is also divided into two parts, viz., the first, which, in communication with the supply-pipe k, extends from the partition to e; the second, communicating with the discharge l, extends from e to the partition. It should have been noted before that the disk by means of a radial slot "straddles" the partition.

From this description it will be apparent that the admission of water through the pipe k will cause the disk to take

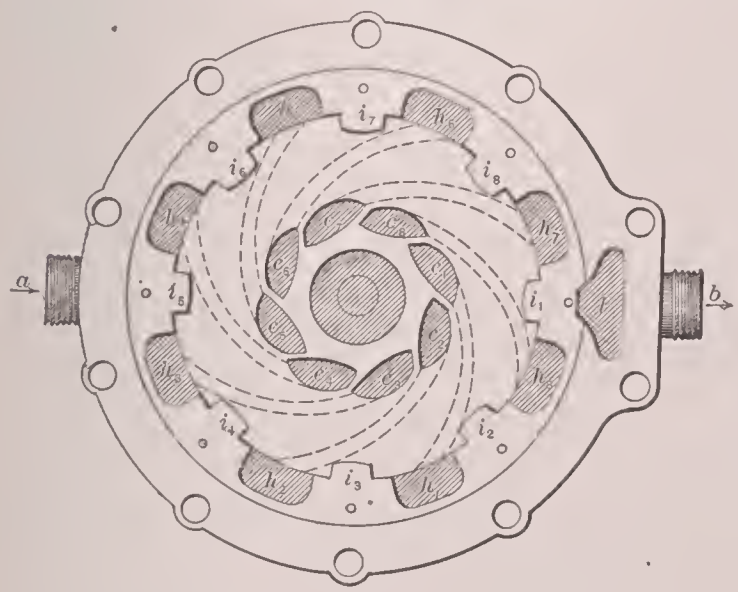


Fig. 3.

an oscillating or "wabbling" motion. The line of contact $e\ f$ will travel round and round the chamber. The point of the spindle p will move in a circle, and at every rotation one-half the contents of the chamber will be discharged. In practice the point of the spindle turns a crank and gives motion to a train of wheel-work, by means of which the amount of the discharge is indicated on a dial-plate.

The combination shown in Figs. 3 to 5 is the crown meter, a type adopted by the city of Boston. Fig. 3 is a plan of the case showing the ports and passages in the bottom. Fig. 4 represents the case with piston. Fig. 5 is a section on the line $a\ b$: B is the piston which rests on the bottom plate and is covered by the top plate, both fitting so closely that the

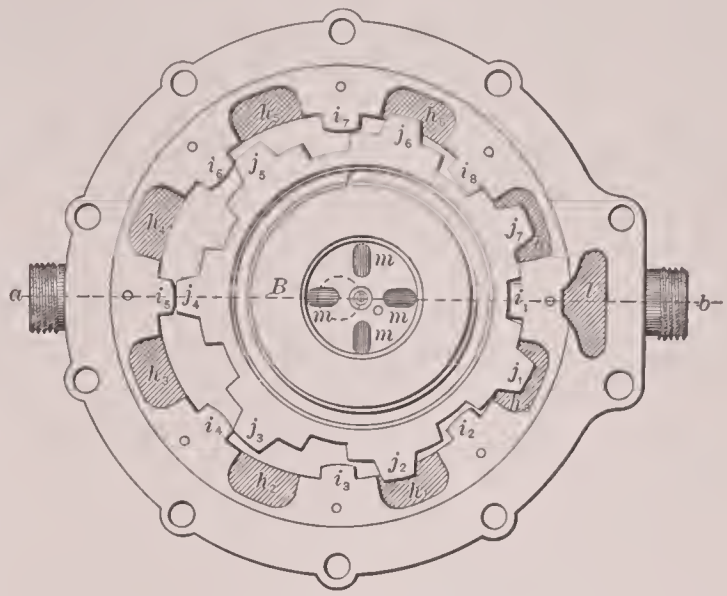


Fig. 4.

piston revolves water-tight between them. The piston, as will be seen, is susceptible of a slight revolving motion, rolling around the case so that its center describes a small circle shown in dotted line at the center of the case. The pro-

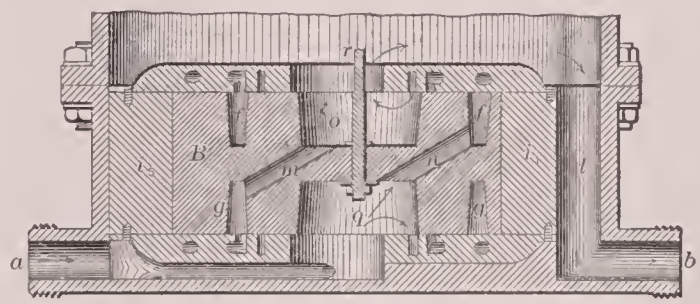


Fig. 5.

jections j on the piston make water-tight contact with the projections i on the case. In the position shown the chamber is divided into two compartments on the line $a\ b$. The piston is provided with the central cavities o above and q below, and the annular grooves f above and g below; g communicates with o by the internal passages $m\ m$, and q communicates with f by the passages n. The two compartments into which the chamber is divided on the line $a\ b$ may be called the high-pressure and the low-pressure compartments. The rotation of the piston is effected by such an arrangement of ports and passages as keeps the high-pressure compartment in communication with the inlet a and the low-pressure in communication with the outlet b. The lower plate has the ports $c_1\ c_2\ c_3$, etc., communicating by means of the curved passages with the spaces $h_1\ h_2\ h_3$, etc. The upper plate is an exact duplicate of the lower, but being reversed in position, it brings the upper port c_4 in communication with h_8 instead of h_4, etc. The space q stands in constant communication with the influx, and, as the piston rotates, successively opens and closes the ports $c_1\ c_2\ c_3$, etc. Likewise the space o is in constant communication with the efflux, and successively opens and closes the upper ports. When the lower port c_2 is opened to the influx through the space q the opposite lower port c_6 is opened to the efflux through the groove g and passage m. When the upper port c_2 is in communication with the efflux through the space o, the opposite upper port c_6 is opened to the influx through the groove f and passage n. As j_4 passes out of contact with i_5, j_3 comes into contact with i_4, and the line of division between high and low pressure is $i_4\ i_8$. This line of division travels round and round the chamber. The spindle r moves the train of wheel-work which registers the quantity of water.

One of the oldest forms of meter which has attained any success is the piston meter, in which the water is admitted alternately to opposite sides of a reciprocating piston. In the early forms two pistons were used which mutually worked each other's valves. Latterly a successful meter has been made with a single piston.

Another type of water-meter adopts the principle of the rotary pump. See PUMP and BLOWING-MACHINES.

Reference must be made to the Venturi meter, a type developed by Clemens Herschel. This is more especially applicable to large quantities of water. As indicated at Fig. 6, it consists simply of a contracted section in the line of

FIG. 6.

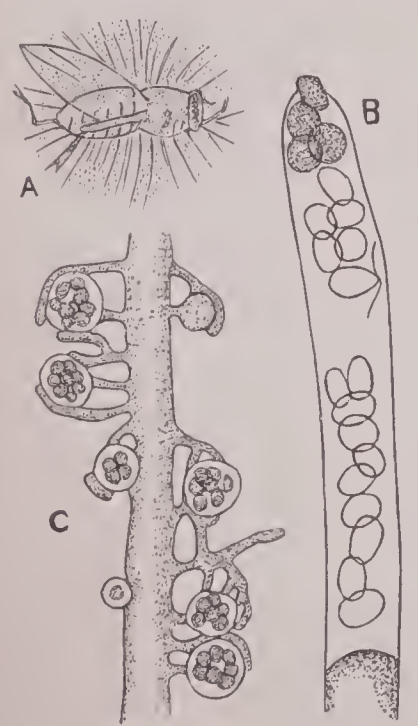
pipe conveying the water. A small pipe, *a*, is inserted at the point where the contraction commences, and another, *b*, at the smallest section of the pipe. The height to which water rises in *a* and *b* indicates the pressure at these points respectively; or when, as more commonly happens, the pressure is too great to be observed in that manner, it can be shown by pressure-gauges.

In moving through the diminishing section of the pipe from *a* to *b* the velocity of the water is greatly increased and its pressure is correspondingly diminished. The difference of pressure between *a* and *b*, coupled with the dimensions of the pipe, is a correct indication of the quantity of water flowing. In moving through the expanding pipe the velocity of the water diminishes, and its momentum is expended in restoring the pressure. The pressure is the same at *c* as at *a*, except the slight loss due to friction.

The action of this meter, whereby it furnishes an indication of the quantity of water passing the pipe, is exceedingly simple. Its freedom from liability to derangement of every kind is also manifest. As regards the registering of its indications, however, it is under a great disadvantage. Every other form of meter imparts a movement to something whereby its indications may be registered through a train of wheel-work. The movement for registering the indications of this meter must be obtained from an independent source actuated like the works of a clock. It is claimed that this difficulty has been overcome and a satisfactory registering mechanism perfected. J. P. FRIZELL.

Water-mole: any one of the ORNITHORHYNCHIDÆ (*q. v.*). See also DUCKBILL.

Water-moulds: the *Saprolegniaceæ*; a family of aquatic, saprophytic or parasitic plants, related to the Downy Mildews and belonging to the order *Siphoneæ* of the class *Chlorophyceæ*. They consist of non-septated, branching filaments which grow in and on the tissues of the host, eventually producing terminal, elongated zoösporangia, from which emerge myriads of biciliated zoöspores. The latter are the active agents of dispersion, and after a period of activity they become covered with a wall and are quiescent for a time; in some cases there is a second period of activity, followed by a second period of rest; eventually they germinate and give rise to new plants.



A, a fly attacked by water-moulds; B, end of a filament, producing zoöspores; C, portion of a filament with antherids and oögones. Highly magnified.

The sexual organs consist of globular or ellipsoid oögones and slender antherids, which are developed upon the main branches of the plant. It is now generally believed that the antherids are impotent, and that the oöspores develop without an actual fertilization; at least it is certain that this is so in many cases. After a period of rest the oöspore germinates by sending out a vegetative filament, which finally develops into a plant similar to that upon which it was produced.

Water-moulds "are found more or less commonly in all fresh waters, but prefer such as are pure and clear. They occur most abundantly and develop most luxuriantly in such waters as contain and favor the growth of the pure-water algae" (*Humphrey*). In such situations they live upon dead woody or herbaceous parts of plants, or the bodies of dead insects, crustacea, fishes, etc. They may attack the eggs of animals, as of fishes, and in certain cases they attack living animals, as the young fishes in fish-hatcheries, and more rarely the large fishes in streams. The salmon in certain rivers in England and Scotland suffered greatly from the attack of a species known as *Saprolegnia ferax*.

All told, there are about sixty known species of water-moulds, belonging to eight or ten genera, of which the most important are *Saprolegnia*, *Achlya*, *Dictyuchus*, and *Leptomitus*.

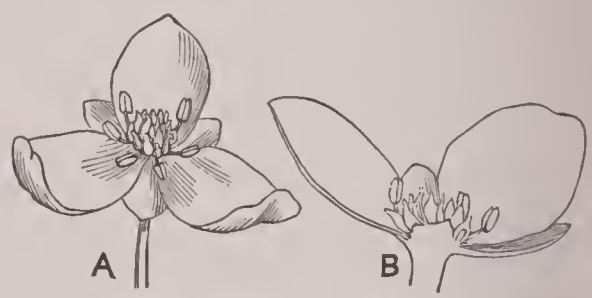
LITERATURE.—Berlese and de Toni, in *Saccardo's Sylloge Fungorum*, vol. vii. (1888); Fischer, in *Rabenhorst's Kryptogamenflora von Deutschland, Oesterreich und der Schweiz*. (1892); Humphrey's *Saprolegniaceæ of the United States, with Notes on other Species* (1892); Schröter, in *Engler and Prantl's Natürliche Pflanzenfamilien* (1893).

CHARLES E. BESSEY.

Water-oats: See RICE, INDIAN.

Water-ouzel: a kind of bird also called dipper. See DIPPERS.

Water-plantain Family: the *Alismaceæ*; a small group (sixty-five species) of mostly aquatic monocotyledons, with hermaphrodite or diclinous flowers; stamens mostly six; pistils six or more, free and superior; ovules one to many; seeds without endosperm. The members of this family may well be regarded as representing the primitive mo-



A, flower of *Alisma plantago*; B, vertical section of flower.

nocotyledonous structure approaching that of the CROWFOOT (*q. v.*) in the dicotyledons. Probably in these two families there is the nearest relationship between monocotyledons and dicotyledons. From fifteen to twenty species occur in North America. *Alisma plantago*, the water-plantain, is very common in shallow ponds and ditches. The numerous species of arrowheads, of the genus *Sagittaria*, are well known from the arrow-like shape of their large leaves. CHARLES E. BESSEY.

Water-plants: See AQUATIC PLANTS.

Water-pores: openings in the epidermis of higher plants structurally identical with the breathing-pores (see STOMATE), but serving as exits for excreted water-drops and not as air-passages. Their guard cells are not movable, hence the pores remain open. They occur at the ends of fibro-vascular bundles, usually at the margins of leaves. In the fuchsia they occur upon the summits of the teeth, into each of which a reduced bundle penetrates. The water exuded by these pores in many cases contains calcium carbonate, which is deposited as evaporation takes place. A full account of these structures is given in de Bary's *Comparative Anatomy of the Vegetative Organs of Phanerogams and Ferns* (English edition, 1884). CHARLES E. BESSEY.

Water-power: power derived from water falling through a certain height whereby its energy is converted by means of hydraulic motors into useful work.

Water-privileges, as they are commonly called, exist on nearly all streams of any considerable magnitude, and in settled countries, where they have become developed or utilized by the construction of dams or otherwise, they are regarded as a kind of property having special value, depending on the quantity of water available and the height of fall. The quantity of water which flows yearly through a stream at a given point depends on the drainage area of the stream above that point and the yearly rainfall over this area. Inasmuch as the rainfall is seldom the same in any two years, and is never distributed through the year in the same proportions in any two years, the quantity of flow of all streams varies not only in different days, weeks, and

months of the same year, but also varies greatly in different years. It will be found generally that the total amount which flows away from a watershed is 50 to 70 per cent. of the rainfall for the year, while the minimum daily flow for a month is many times less than the average, and the maximum many times greater. On account of these variations of flow a storage reservoir is necessary for water-powers, and a certain proportion between the capacity of such a reservoir and the number of square miles in the watershed is necessary if the full average daily flow for the year is to be secured. This proportion is seldom realized, on account of the expense attending the establishment of reservoirs; and the consequence is that a vast majority of the improved water-powers of the world are subject to great fluctuations of supply. In wet seasons a large quantity of water runs to waste over the dams, and in dry seasons the supply is deficient, often requiring the stopping of mill machinery.

The quantity of power which any privilege can furnish depends not only on the quantity of water, but also directly on the available fall. When the available head and the quantity of water which flows are determined, the total theoretical energy of the water for a given time is found by multiplying the number of pounds of water that flows during this time by the number of feet of fall. This will give the energy expended in foot-pounds. If the time be one minute, and the number thus obtained be divided by 33,000, the theoretical horse-power of the waterfall will be given. Since no motor can realize a perfect efficiency, however, the actual horse-power is less than the theoretical. If we suppose the motor to utilize 75 per cent. of the available energy, the horse-power will be found by dividing the product of the height and weight of water which flows in one minute (in feet and pounds) by 41,000. It is very difficult, however, to estimate the horse-power of a water-privilege with exactness, as it must vary with the varying flow of water; nothing, in fact, being fixed but the fall.

The motors employed in connection with water-powers are known as water-wheels and water-engines; the latter being used, however, only to a limited extent for small powers. Water-wheels are classed as overshot wheels, breast wheels, undershot wheels, and turbines, the latter forming a distinct class of modern development which has superseded to a great extent the other classes. See TURBINE and WATER-WHEELS.

The great water-powers of Holyoke, Lowell, Lawrence, Birmingham, and Minneapolis, in the U. S., may be referred to as illustrative on a grand scale of the value of improved water-powers, while the mills scattered throughout nearly every populous district of civilized communities furnish examples on smaller scales. Yet a great many unoccupied and unimproved sites for valuable water-powers still remain. It has been estimated that the rivers of the U. S. can furnish about 200,000,000 horse-power, while the amount utilized is only about 1,500,000 horse-power. The possibilities for the future are hence very great, and when coal becomes high in price water-power is sure to take the place of steam. In addition an enormous amount of available power is wasted twice every day by the energy expended in the fall of the tides, and only the expense of deriving power from this source prevents its utilization.

Water-power is often sold by the "mill-power," which in any particular case is defined by a certain quantity of water under a given head. At Holyoke a mill-power is 38 cubic feet a second under 20 feet head, or 86 theoretic horse-powers. At Minneapolis it is 30 cubic feet a second under 22 feet head, or 75 theoretic horse-power. At Holyoke the cost of one mill-power for sixteen hours a day is $300 a year.

The possibility of transforming power into electric energy by means of dynamos and of transmitting it to considerable distances has given a marked impetus to the development of water-power. Many cities are lighted and many lines of electric railway are operated by power thus transmitted through distances of from 5 to 20 miles, while in one or two special cases the distance is over 100 miles. The utilization of the power of Niagara Falls is an example.

The mean discharge of the Niagara river above the falls, as determined in 1892 by the U. S. Corps of Engineers, is 230,000 cubic feet a second. A vertical descent of 160 feet occurs at the falls. The theoretic power of the falls is then about 4,000,000 horse-power, nearly equal to all the power, both water and steam, used in the U. S. The possibility of utilizing a portion of this has long been discussed, and a number of mills on the U. S. side below the falls have been erected to which water is led by canals from points above. In 1892 the construction of a very large power-plant was begun by the Cataract Construction Company on the U. S. side of the river about 1¼ miles above the city of NIAGARA FALLS (*q. v.*). The water is led from the river by means of a canal 1,260 feet long to the wheel-pits, passes down through steel penstocks 7½ feet in diameter to turbines, which are placed 136 feet below the head-water level. After leaving the turbines the water falls to the bottom of the wheel-pit and is carried by a tunnel, over 7,000 feet long, to the river below the American fall. The wheel-pits are designed for ten turbines, which in total can furnish 50,000 horse-power, converted into electrical energy by means of dynamos. The work was partly completed and the first power delivered in 1895. See TURBINE and TUNNELS AND TUNNELING.

Surveys and plans of other companies on both sides of the Niagara river have been undertaken with the intention of erecting other large power-plants. As all of these can scarcely utilize more than 5 per cent. of the total available power, the quantity of water passing over the falls can not be materially diminished. The cost of water-power, when produced under favorable conditions, varies from one-eighth to one-fourth of that of steam-power. See HYDRAULICS and WATER-WHEEL. MANSFIELD MERRIMAN.

Water-proofing: the art of rendering textile fabrics, paper, and other substances impervious to water. This result is usually obtained either by applying an insoluble coating upon the surface, or by causing the formation of a compound that exerts a repellent action toward water in the pores of the article, often by means of double decomposition. One of the most important branches of this art is the application of India-rubber in the preparation of mackintoshes and other water-proof wearing apparel. (See INDIA-RUBBER.) Woolen and other goods may be rendered water-proof by first saturating them with a solution of soap, then with a solution of alum, or by successive immersions in solutions of gelatin and galls (tannic acid), whereby the same compound that is formed in the tanning of leather is produced. Paper is rendered impervious to grease and water by immersing it, when unsized, in a solution of shellac in borax. The product obtained in this manner somewhat resembles parchment paper. The Japanese and Chinese are said to prepare water-proof paper for the manufacture of umbrellas, water-buckets, rain-coats, etc., by treating it separately with solutions of potassium dichromate and glue, the gelatin being thus rendered insoluble. Revised by IRA REMSEN.

Water-ram: See HYDRAULIC RAM.

Water-rat, or **Beaver-rat**: the *Hydromys chrysogaster* of Tasmania; an animal resembling the muskrat in many particulars, and deriving its scientific name from the golden-yellow color of its belly; the back is of a dark rich brown. It is an expert swimmer, frequents both salt and fresh water, is nocturnal in habits, and when eating supports itself upon the hind legs and tail.

Water-rice: See RICE, INDIAN.

Watershed [*water* + *shed*, a parting < O. Eng. *scēadan*: Germ. *scheiden*, part, separate]: a geographical term of somewhat ambiguous meaning, as it has been used in different senses by various writers. Some apply the term to the slopes of the land from which water is shed to a river, thus making every valley consist of two watersheds which unite along the stream-line. Others, with the support of etymology and better usage, mean by it the line of water-parting that separates the slopes on the two sides of a height of land. In the U. S. the word divide has come into general use; this lends itself better to derivative terms, such as "subdivides," the name for the numerous subordinate water-partings between the minor streams of a river system; "undivided" areas, meaning the plain surfaces which are not yet dissected by streams, and from which the rainfall is disposed of more by penetration into the soil or by evaporation than by run-off. These are by no means rare. It is a serious error to suppose that watersheds are necessarily well defined. They may be very indefinite, being areas rather than lines, as between the branches of the Missouri and the Saskatchewan on the undivided plains of the Rocky Mountains. Whenever one side of a divide is eroded more rapidly than the other, the watershed will be shifted toward the side of slower wasting. (For such "migration of divides," see RIVERS.) In some cases divides are altered by movements of the land. The former discharge of Lake Huron and Georgian Bay across the province of Ontario to the lake of that name has

been changed by a general uplift of the land to the N. E.; thus a divide now crosses the former path of the lake outlet. (See NIAGARA.) The former presence of a great ice-sheet over Canada and some of the Northern U. S. greatly interfered with the discharge of rivers in accordance with land watersheds; thus many of the great lakes were for a time drained by southward overflows when the ice stood in the way of their present northeastward discharge. The former channels of these temporary overflows are easily traceable at several points; for example, along the path of the canal now in construction by which Lake Michigan is again to be in part drained southward; and between the head waters of the Maumee and Wabash in Northern Ohio, where Lake Erie once ran over to the Mississippi system. It occasionally happens that a lake has two or more outlets, several such lakes being known in Canada. The line of the watershed between the outflowing streams is then practically interrupted on the lake surface. W. M. DAVIS.

Water-spaniel: any one of several breeds of the spaniel, distinguished by fondness for swimming. They have rather long, curled hair, which has an oily feel and turns water very well. They are largely used by sportsmen for the purpose of fetching out of the water the game which they have shot, or of swimming to the opposite bank of a river or to an island and starting therefrom the various birds that love such moist localities. The Irish water-spaniel is a dark brown, frequently with a white spot on the breast. F. A. L.

Waters, Pollution of: See the Appendix.

Waterspout: a secondary storm closely allied in formation to the tornado, hail-storm, thunder-squall, and white squall. Under certain conditions the broad, thin "sinks" of revolving air called cyclones develop in the southern and southeastern octant, small secondary depressions which are called, according to their formation, intensity, and appearance, tornadoes, hail-storms, thunder-storms, and waterspouts. Two prime conditions must exist for the occurrence of these vorticular storms; first, a condition of unstable equilibrium of the air; and, second, a gyratory motion. The axis of such storms is not necessarily vertical, and hence in a waterspout the dark spout portion may writhe and twist in a manner similar to the funnel-shaped cloud of the tornado. The whirling is counter-clockwise. The beginning of a waterspout is generally a pendent cloud on the under surface of a large cloud-layer. The tapering whirl apparently descends and the sea-water immediately below appears to rise and meet it. What really occurs, however, is cloud condensation, and but little sea-water is carried aloft. Ships have sailed into waterspouts in process of formation with the barometer remaining unaffected until the spout itself was almost reached. At the center of the spout the diminution of pressure is marked, and objects there experience not only strong in-flowing, whirling, and out-throwing forces, but also the explosive force due to a rapid expansion of confined air. Waterspouts are most frequently seen in tropical seas, but are by no means rare in higher latitudes. As many as twenty spouts have been seen within an hour, from five to seven at the same time. It is generally believed that the firing of a cannon or any violent concussion of the air will dissipate waterspouts, but cannon have been discharged directly at spouts without such results, and there is no known reason for such a result. ALEXANDER MCADIE.

Water-supply: See WATER.

Water-tiger: See DYTISCIDÆ.

Watertown: town (incorporated in 1630); Middlesex co., Mass.; on the Charles river, and the Fitchburg Railroad; 8 miles W. of Boston (for location, see map of Massachusetts, ref. 2–H). It contains the villages of Watertown, Mt. Auburn, and Bemis; has seven churches, high school, seven district schools, public library, electric railway to Boston, the noted Mt. Auburn Cemetery, an important U. S. arsenal where a large amount of modern ordnance-work is being done, a national bank with capital of $100,000, a savings-bank, and a weekly newspaper; and is principally engaged in ordnance-work and the manufacture of woolen goods, starch, needles, stockings, cardigan jackets, paper bags, etc. In 1894 it had an assessed valuation of $8,251,400. Pop. (1880) 5,426; (1890) 7,073; (1900) 9,706.

EDITOR OF "ENTERPRISE."

Watertown: city (settled in 1800, incorporated as a city in 1869); capital of Jefferson co., N. Y.; on the Black river, 8 miles above its mouth in Black River Bay, Lake Ontario, and on the Rome, Watertown and Ogdens. Railroad; 71 miles N. of Syracuse, 90 miles N. W. of Utica (see map of New York, ref. 2–G). It is within an hour's ride of the Thousand Islands and but 12 miles from historic Sacket Harbor. The business portion centers around a beautiful public square containing two small parks and a handsome fountain; the manufacturing establishments extend along the river for 3 miles; the residence portion spreads from both banks of the river and out from the business center in every direction. Small triangular parks with fountains are scattered throughout the city. Electric street-railways extend from the city to neighboring villages. Among the notable buildings are the post-office, State armory, opera-house, Jefferson County Savings-bank, Henry Keep Home for the Aged, the county buildings, and several fine church edifices. There are 20 church societies: Methodist Episcopal, Presbyterian, Protestant Episcopal and Roman Catholic, 3 each; and Universalist, Baptist, Congregational, Disciples, Free Methodist, African Methodist Episcopal Zion, Spiritualist, and Jewish, 1 each. The public schools number 9, with graded system, high school, and night-school. The enrollment is 3,000, number of teachers 80, annual cost $47,000. Other educational institutions are a private day-school for girls, kindergarten, business college, Convent of the Immaculate Heart, St. Joseph's parochial and apostolic schools, and St. Joachim Academy and kindergarten. The city has a bureau of charities and active societies for the prevention of cruelty to children and animals, city hospital, orphans' home, county jail, and 2 daily, 3 semi-weekly, and 4 weekly newspapers. The annual city receipts are $150,918; expenditures, $109,430; debt, $103,000; and property valuation, $8,549,230. There are 5 national banks with combined capital of $571,240, and 2 savings-banks with aggregate deposits of $2,150,000. The principal business interests are allied with agriculture and manufacturing. There are 4 carriage and wagon works, 10 paper-mills, 4 roller flour-mills, 3 machine-works and foundries, planing-mills, air and vacuum brake-works, marble-finishing works, corn-canning factories, steam-engine works, and manufactories of furniture, electrical machinery, paper-mill machinery, printing-presses, thermometers, underwear, and tools and locks, brass goods, spirit-levels, lamps, tinware and peddlers' supplies, boats, agricultural implements, etc. Manufacturing is promoted by water-power derived from the rapids and falls of Black river within the city boundaries. The city owns its own water-works, which cost $300,000. Pop. (1880) 7,883; (1890) 14,725; (1900) 21,696.

CHARLES E. COLE, "WATERTOWN DAILY TIMES."

Watertown: city (founded in 1881); capital of Codington co., S. D.; on the Big Sioux river, and the Burl., Ced. Rap. and N., the Chi. and N. W., the Gt. North., and the Minn. and St. L. railways; 70 miles N. E. of Huron, 93 miles W. of Benson (for location, see map of South Dakota, ref. 5–G). It is in a wheat-growing and stock-raising region, 3 miles from Lake Kampeska, the most beautiful lake in the State, and has 8 churches, graded public schools, 3 national banks with combined capital of $150,000, and 3 weekly newspapers. Pop. (1890) 2,672; (1900) 3,352.

EDITOR OF "JOURNAL."

Watertown: city (settled in 1836); Dodge and Jefferson cos., Wis.; on the Rock river, and the Chi. and N. W. Railway; 39 miles E. by N. of Madison, 44 miles W. by N. of Milwaukee (for location, see map of Wisconsin, ref. 7–E). It is bisected by the river, which furnishes valuable water-power for manufacturing; is surrounded by a thickly settled and highly cultivated agricultural region; contains the Northwestern University (Lutheran), College of Our Lady of the Sacred Heart (Roman Catholic), public high and graded schools, a national bank with capital of $50,000, and 2 State banks with combined capital of $125,000; and has 4 weekly newspapers. It is an important cheese and barley market. Pop. (1880) 7,883; (1890) 8,755; (1900) 8,437.

EDITOR OF "GAZETTE."

Water Valley: city; Yalobusha co., Miss.; on the Ill. Cent. Railroad; 17 miles S. of Oxford, 28 miles N. N. E. of Granada (for location, see map of Mississippi, ref. 5–G). It is in an agricultural and dairying region, with extensive forests of valuable timber in the vicinity, and has 11 churches, public schools for white and colored children, 2 State banks with combined capital of $49,125, cotton and broom factories, large railway, machine, and car shops, and a monthly and 4 weekly periodicals. Pop. (1880) 2,220; (1890) 2,832; (1900) 3,813.

EDITOR OF "NORTH MISSISSIPPI HERALD."

Waterville: city; Kennebec co., Me.; on the Kennebec river, and the Maine Cent. Railroad; 18 miles N. by E. of Augusta, 80 miles N. E. of Portland (for location, see map of Maine, ref. 9–C). It was settled about 1650, was formerly a part of Winslow, was incorporated as a town in 1802, had West Waterville set off from it in 1873, and was chartered as a city in 1888. It derives excellent power for manufacturing from Ticonic and other falls, and has 2 cotton-mills running 90,000 spindles, 2 iron-foundries, 2 tanneries, railway construction and repair shops, saw and grist mills, 2 brick-yards, slate-quarries, and shovel-handle factory. The city is the site of COLBY UNIVERSITY (*q. v.*), and of Coburn Classical Institute, and has 8 churches, a high school, convent, parochial school, 3 national banks with combined capital of $400,000, a trust and deposit company with capital of $100,000, a savings-bank, 2 building and loan associations, and 3 weekly, a semi-monthly, and 2 monthly periodicals. Pop. (1880) 4,672; (1890) 7,107; (1900) 9,477.

EDITORS OF "MAIL."

Waterville: village (named in 1807, incorporated in 1870); Oneida co., N. Y.; on the Del., Lack. and West. Railroad; 22 miles S. W. of Utica, the county-seat (for location, see map of New York, ref. 4–H). It is in a hop-growing region, and has 6 churches, graded union school with library, a national bank with capital of $150,000, a private bank, 2 steam grist-mills, shoe, paint, and wood-working factories, race-track and agricultural fair-grounds, Y. M. C. A., Granger, and Masonic halls, a crematory, and a semi-weekly newspaper. Pop. (1880) 1,184; (1890) 2,024; (1900) 1,571.

EDITOR OF "TIMES-REFLEX AND HOP REPORTER."

Water-violet: See FEATHERFOIL.

Watervliet: See WEST TROY.

Water-wheels: wheels for utilizing the energy of a waterfall, the water entering the wheel only upon a portion of the circumference. Water-wheels are usually vertical, turning upon horizontal axes. When the water enters around the entire circumference the wheel is called a turbine; these are usually horizontal, revolving on vertical axes. Turbine wheels are more extensively used than all other kinds of hydraulic motors; they are described in the article TURBINE.

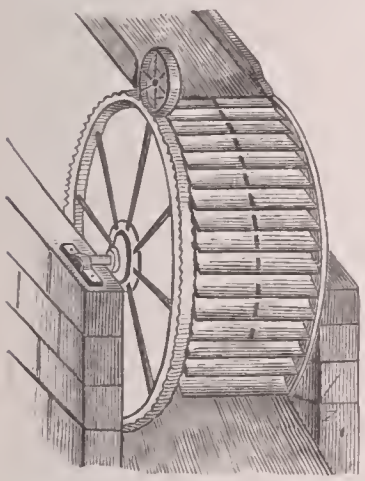


FIG. 1.—Overshot wheel.

The overshot wheel is an old form especially adapted to high falls. The water from the reservoir is led through a feeding canal to the upper part of the wheel, where it falls into buckets. The action of the water is then almost entirely that of weight, and the work performed is closely equal to the weight of water multiplied by its fall in the wheel. The overshot wheel revolves slowly, but its efficiency is high, from 80 to 90 per cent. of the theoretic work being utilized. On account of its large size and the liability to become clogged with ice in the winter time it has been mostly superseded by turbines. One of the largest overshot wheels is that at Laxey, on the Isle of Man; it is 72½ feet in diameter, and develops about 150 horse-power.

The breast wheel is similar to the overshot wheel in general appearance, but it receives the water near the middle of its height instead of near the top. The water acts mainly by weight, but also to a certain degree by impulse, at the point of entrance. Its efficiency is from 70 to 80 per cent. of the theoretic work.

Undershot wheels in great variety have been constructed. Those with plane radial vanes are used in running streams, and are of low efficiency. The form devised by Poncelet has a curved sill and guide by which the water is directed tangentially against the vanes, and its efficiency is from 60 to 70 per cent. In these wheels the water acts almost entirely by its impulse, and the advantageous velocity of revolution is one-half that of the velocity of the entering water.

Vertical impulse wheels, which are driven by a stream of water issuing from a nozzle under high pressure, have been developed since 1880, and are highly advantageous on account of their small size and consequent portability. The water is brought to the wheel through a pipe or hose, and delivered tangentially against a series of small buckets on the circumference. The velocity of revolution is rapid. A

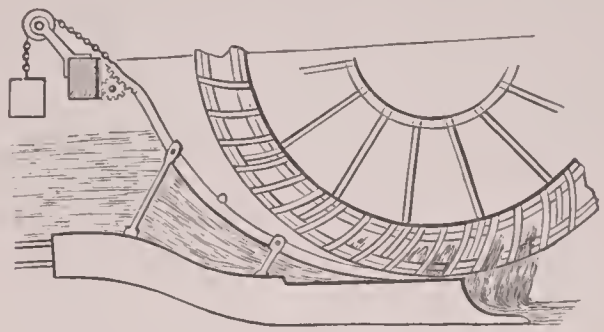


FIG. 2.—Poncelet's undershot wheel.

Pelton wheel at the Sutro tunnel, in Nevada, 36 inches in diameter, is driven under a head of 2,100 feet, and makes 1,150 revolutions a minute, a stream of water from a nozzle ½ inch in diameter furnishing nearly 100 horse-power. With buckets properly curved, so that the water is turned back contrary to its original direction, this form of wheel has been found to have an efficiency of 83 per cent.

The principles of the design of water-wheels may be summarized by saying that the water should enter the wheel without shock and leave without velocity. When the vanes are so designed that the water enters upon them tangentially, shock, together with the consequent losses in eddies and foams, is avoided. When the water leaves the wheel without velocity all its available energy has been expended. It is not possible to realize either of these conditions fully, and in addition frictional resistances consume from 5 to 10 per cent. of the total work, so that efficiencies of over 90 per cent. are rarely obtained.

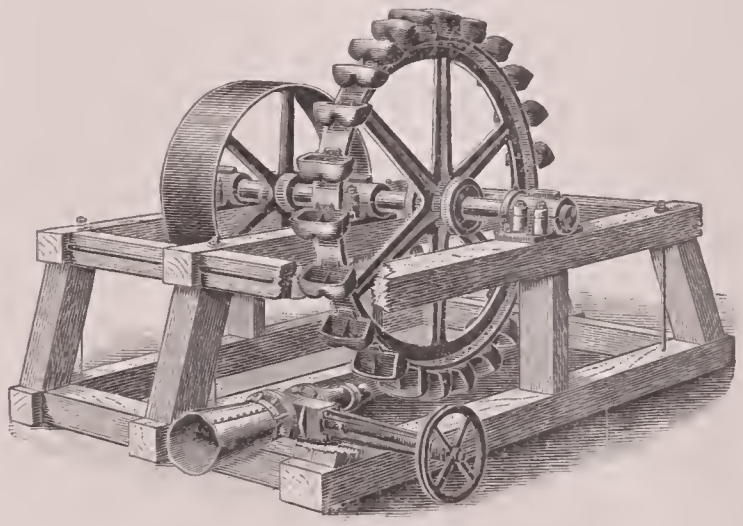


FIG. 3.—The Pelton impulse water-wheel.

A water-wheel is tested by means of a friction-brake or dynamometer attached to a pulley on its axis. All the work of the wheel is then expended in producing friction, and this is balanced by weights acting at the end of a lever. From the load thus balanced, the length of the lever, and the number of revolutions of the wheel per minute, the actual work of the wheel is computed, while the theoretic work is found by finding the weight of water expended per minute and its effective head. Thus both the power and the efficiency of the wheel are ascertained, and by running it at different speeds the velocity which gives the maximum efficiency is also determined.

See Weisbach's *Hydraulics and Hydraulic Motors* (New York, 1877); Björling's *Water or Hydraulic Motors* (London, 1894); and also the works mentioned in the article TURBINE.

MANSFIELD MERRIMAN.

Waterwitch: See GREBE.

Water-works: constructions and appliances for the collection, preservation, and distribution of water for the supply of communities. For the supply of large communities access to streams of a size sufficient to furnish the required quantity at all times can not usually be had; and when possible the stream is ordinarily exposed to contamination, which makes its use objectionable. The most suitable sources of supply are small streams in sparsely inhabited districts. The flow of such streams is enormously variable, being sometimes as much in an hour as at other times in a month. They can furnish no constant supply

of any magnitude without the aid of storage-reservoirs. The most that is ordinarily attempted is to utilize a quantity equal to the flow of the driest year. Experience has shown that to accomplish this the reservoirs must be capable of containing about four months' supply. That is, if the minimum yield for a sufficiently long series of years is 14·68 inches of water, which is equivalent to about 700,000 gal. a day to the square mile, the reservoirs should be sufficient to deliver 700,000 gal. a day for each square mile of drainage-ground during a period of about four months. This is a reservoir capacity of 85,000,000 gal. per square mile of drainage-ground. In some European systems of water-works an attempt is made to economize the flow of the three driest known consecutive years. For this purpose the reservoir capacity must be equal to about six months' supply. The average rainfall of the three driest consecutive years of a long series is usually represented very closely by the general average rainfall diminished by one-sixth. Where, for instance, the average rainfall of a series of years, thirty or more, is 48 inches, the average of the three driest consecutive years will be about 40 inches. Assuming 20 inches collectible, this would be about 952,000 gal. daily per square mile. The reservoirs must be sufficient to contain six months' supply at this rate—viz., about 174,000,000 gal. per square mile of drainage-ground. To economize the total yield of the drainage-ground there would be required a reservoir capacity equal to the average flow of from nine to eighteen months—that is, in the case just supposed, from 260,000,000 to 520,000,000 gal. per square mile of drainage-ground. The gallon spoken of here, unless otherwise stated, is the U. S. standard gallon, 231 cubic inches, being 58,373 troy grains at the maximum density. A cubic foot contains 7·48 gal. The imperial gallon contains 10 lb. of water at a temperature of 62° F., so that a cubic foot contains very nearly 6¼ imperial gallons.

Considerable quantities of water are often obtained by pumping from deep wells. This term is used in distinction from shallow wells, which in all countries are the chief source of water-supply for isolated dwellings. The geological formations composing the earth's crust are always saturated to within a few yards of the surface with water. The quantity of water contained by different materials varies greatly. Sand, gravel, and chalk contain from 2 to 2½ gal. a cubic foot; magnesian limestone, about 2 gal.; building-sandstone, about three-fourths of a gallon; granite, one-fifth of a gallon. A square mile of sandstone formation 500 yards deep contains water sufficient for nine months' supply of New York city. But such a region, once exhausted of water and depending on rainfall for its replenishment, would require more than 200 years to fill up again. Water drawn from such formations by deep wells forms the supply of many European towns, though this mode of obtaining water is but little practiced in America. The city of Liverpool, England, with a total supply of 20,000,000 imperial gal. a day, derives 6,250,000 from wells in the new red sandstone underlying the region. The wells are from 100 to 250 feet deep, and are supplemented by bore-holes reaching 200 to 500 feet deeper. There are four such wells in use, furnishing from 830,000 to 2,900,000 imperial gal. a day each. The city completed in 1891 a system of water-works on a stupendous scale, consisting of a reservoir on the head-waters of the Severn, in Wales, to hold 10,000,000,000 or 12,000,000,000 imperial gal., and an aqueduct 68 miles in length to the service reservoirs of the city, at a cost for the entire system of $10,000,000. Birkenhead, near Liverpool, containing 99,184 people in 1891, derives its entire supply from wells and borings in the sandstone. The Kent Company, one of the companies supplying London, pumps daily about 8,000,000 imperial gal. from wells reaching the chalk formation; the New River Company has the capacity to draw about 9,000,000 gal. a day from the same source. The excessive pumping in London has resulted in a progressive lowering of the level to which water will rise in deep wells, amounting to more than 100 feet since the beginning of the nineteenth century. Among places of minor importance in England, probably not less than one-half draw their supply of water from deep wells. Deep wells have not been much used in the U. S., except for special purposes, as obtaining a supply of pure water for paper-mills, breweries, etc. Some towns in Texas obtain domestic supplies from this source. Galveston, on the Gulf coast, has a system of this kind. Many towns have adopted systems of driven wells, consisting of pipes carrying strainers, driven into beds of gravel or sand, and have thus obtained limited supplies of very pure water.

Consumption.—The purposes to which the water-supply of towns is applied may be embraced under three general heads: 1, domestic supply; 2, trade supply; 3, watering. The first includes the manifold uses and waste of water in dwellings; the second, its use in various manufacturing establishments, as bleacheries, dye-works, laundries, sugar-refineries, breweries, distilleries, the working of elevators and supply of steam-boilers, and in some cases for mechanical power; the third includes watering streets and grounds, extinguishing fires, flushing sewers, etc. In London the domestic supply amounts to about 82 per cent. of the total, which is probably about the average for commercial cities. In manufacturing towns not using water-power the second item is more important, amounting sometimes to one-third or more of the total. The third item is not more than 5 per cent. on an average, being next to nothing in the winter, and sometimes reaching as high as 20 per cent. in hot weather and in suburban districts.

The following table of water-works data for twenty cities in the U. S. is obtained from the *Engineering News's Manual of Water-works* for 1890–91:

CITIES.	Population supplied.	No. of taps.	No. of meters.	No. of hydrants.	Daily consumption, gal.		
					Total.	Per head.	Per tap.
New York *	1,515,301	108,884	22,072	8,576	121,000,000	79	1,111
Chicago	1,085,000	....	3,924	11,836	152,000,000	140	....
Philadelphia	1,040,000	170,911	522	7,749	138,000,000	132	806
Brooklyn	806,343	93,225	2,263	4,251	55,000,000	72	616
St. Louis	451,770	38,183	3,115	3,515	32,500,000	72	851
Boston †	527,606	80,238	4,018	6,532	42,000,000	80	525
Baltimore	434,439	74,728	913	1,815	41,000,000	94	548
San Francisco	298,997	30,200	12,505	1,670	18,000,000	61	608
Cincinnati	302,581	35,439	1,451	.....	34,000,000	112	959
Cleveland	270,055	30,938	1,794	3,561	28,000,000	103	898
Buffalo	255,664	40,331	94	2,589	47,500,000	186	1,178
New Orleans	242,039	4,450	20	1,208	9,000,000	37	2,017
Pittsburg	238,617	32,851	57	1,532	47,500,000	146	....
Washington	230,392	35,404	98	1,080	36,500,000	153	1,033
Detroit	205,876	40,351	856	1,828	33,000,000	161	823
Milwaukee	204,468	18,422	5,876	1,532	22,500,000	110	1,215
Newark	185,317	21,532	520	1,460	14,000,000	76	654
Minneapolis	164,738	9,990	633	1,996	12,500,000	75	1,243
Jersey City	197,438	20,456	240	1,738	19,300,000	97	....
Louisville	161,129	13,512	792	620	12,000,000	74	879

* The municipal census of New York for 1890 gave the population 1,710,715.

† Boston supplies Somerville, Chelsea, and Everett, with a total population of 79,129.

The following data concerning consumption of U. S. cities are taken from the Report of the Massachusetts State Board of Health on metropolitan water-supply. The table shows the average daily consumption of water per inhabitant in various cities; it will be noticed that the amount has largely increased.

CITIES.	DAILY CONSUMPTION PER INHABITANT.		Daily consumption per inhabitant in 1893, in gals.
	Year.	No. of gals.	
Boston (Cochituate district)	1850	42	107
Boston (Mystic district)	1865	27	86
Chicago	1860	43	147
Philadelphia	1860	36	150
Brooklyn	1865	29	86
St. Louis	1872	45	96
Cincinnati	1850	20	124
Cleveland	1860	14	130
Detroit	1855	44	148
Milwaukee	1875	29	108
Louisville	1865	18	75
Providence	1877	24	63
Lowell	1875	24	79
Fall River	1874	12	27
Cambridge	1870	44	80
Lynn	1873	41	54

In 1894 the daily rate of consumption per inhabitant in Washington, D. C., was 187 gal.

The table on the next page is from *Waterworks Engineering*, by Turner and Brightmore (London, 1893).

The most striking feature of these tables is the difference in consumption between cities in Europe and those in the U. S., the highest consumption of the latter being about equal to the lowest of the former. This is due in some degree to the general wasteful habits of Americans, but more especially to the fact that in European towns consumers of water are usually under some control and restraint in its use. In the U. S. such restraint is rarely exercised, and reckless and wanton wastefulness prevails. The evil is constantly growing, and the above figures for Buffalo, Chi-

WATER-SUPPLY OF CERTAIN TOWNS IN GREAT BRITAIN.

TOWNS.	Estimated population.	SUPPLY PER HEAD PER DAY.		Nature of the source of supply.
		Imperial gallons.	U. S. gallons.	
London	5,240,000	33	39½	Rivers, springs, and wells.
Manchester	950,000	22	26	Catchment.
Glasgow	850,000	50	60	"
Liverpool	770,000	26	31	Catchment and wells.
Birmingham	640,000	22	26	Rivers and wells.
Bradford	400,000	25	30	Catchment.
Edinburgh	350,000	40	48	"
Nottingham	240,000	18	22	Wells.
Brighton	180,000	33	39½	"
St. Helens	70,000	20	24	"
Bath	60,000	20	24	Springs.
Torquay	45,000	30	36	"
Chester	40,000	28	34	River.
Exeter	40,000	38	46	"
Scarborough	30,000	23	28	Springs and wells.
Leamington	25,000	19	23	Wells.

cago. Washington, etc., show that it is impossible to assign any limits to the consumption under such a system. The simplest mode of restraining waste is by means of an intermittent supply, each consumer having a reservoir fitted with a self-closing cock. Water is turned on once a day long enough to fill all reservoirs, and then shut off. This method has been, and still is, much practiced in English towns. It is chiefly objectionable as regards fires. With constant supply the best means of restraining waste hitherto adopted consists in a system of inspection to detect defective fittings, pipes, and appliances and enforce remedies. In the city of Norwich, England, the consumption was reduced from 40 to 15 gal. by such means. A very complete system of this kind has been in force for a number of years in Liverpool, and to this is due the low consumption there. The city has been divided into a number of districts, in each of which the aggregate consumption is measured by meters. The nightly indications of these meters show which districts are most in need of inspection. No premises are entered unless waste is observed. Inspections to detect waste are made at night after all legitimate consumption has ceased. The inspector applies his wrench or key to the street stop-cock controlling the service-pipe which supplies the premises, and nearly closes the cock. Then, applying his ear to the key, the passage of a very minute quantity of water can be detected. If waste is observed, the house is entered in the daytime, the fittings carefully inspected, and defects pointed out, which the owner is required to remedy. Previous to the adoption of these measures the city had been on intermittent service. At one time in 1865 water was furnished for only three hours a day. Constant service was restored for a short time in 1873 as an experiment. It appeared that its maintenance would require a daily supply of 33½ imperial gal. a head. The results of these inspections were surprising. In a large district the consumption was reduced to 12 imperial gal. a head. In a district containing 2,134 persons it was reduced to 6 or 7. In 1875 the constant service had been restored to nearly the entire town, with a consumption much less than had formerly been required with intermittent service. It is conceded that only the most stringent legal provisions, and the most ample authority on the part of officers for their enforcement, can avail to restrain the wasteful tendencies of consumers.

A department of inspection and waste was organized about 1883 by the city of Boston on the same general plan as for Liverpool, so far as the nature of the appliances in use would permit, Boston not being furnished with sidewalk stop-cocks. The official report for 1884 claimed a reduction of the daily consumption from 91 to 70 gal. a head. Later these good results seem to have disappeared. The daily consumption rose in 1893 to over 100 gal. a head.

These results show that a material diminution of waste may be effected by simply pressing the matter upon the attention of consumers. Nevertheless, the only remedy that will go to the root of the evil is a system of charges based upon the quantity of water actually drawn by each consumer. The difficulty in the way of this result has hitherto been the want of a reliable water-meter at a reasonable cost. (See WATER-METER.) Mechanical skill may be said to have fairly supplied this want, and the question is now presented to the taxpayers in great cities whether, instead of spending great sums of money to provide additional supplies of water, it may not be judicious to undertake the task of enforcing a proper use of the supply already at hand.

Constructions.—The multifarious applications of water in a city require a considerable pressure in the distributing-pipes. This is secured in two ways: (1) by adopting a natural source of water at a sufficient elevation; (2) by pumping. The most obvious classification of the systems of water-supply is that of gravitation systems and pumping systems. The configuration of the ground is rarely such as to furnish a source sufficiently elevated and sufficiently near, capable of supplying the requisite quantity at all seasons of the year. The principal elements of a gravitation system are—(1) the drainage-grounds; (2) the storage reservoirs; (3) the conduit; (4) the distributing or service reservoirs; (5) the distributing-pipes. The pumping system commonly lacks the feature of storage reservoirs, and has in addition the pumping establishment and force main, and ordinarily arrangements for filtering or otherwise purifying the water. There are, however, pumping systems with storage reservoirs, of which Brooklyn, N. Y., is an example, and there are gravitation systems in which the water is subjected to filtration, as in the case of Dublin, Ireland.

The conduit or aqueduct conveys the water from the source to the distributing reservoir in or near the city. In extensive works it is ordinarily of masonry, not being intended to sustain any pressure. It is built to a nearly level grade, having only sufficient inclination to give motion to the water. Intervening ridges are cut down or pierced by tunnels. Valleys are crossed by embankments of earth or earth and masonry combined, or by rows of arches. In crossing deep valleys or rivers the masonry of the aqueduct is sometimes interrupted, and the water flows in iron pipes, which descend into the valley and rise and re-enter the aqueduct on the opposite side. In the ancient aqueducts, where, from the limited knowledge of iron-working, such expedients could not be adopted, these crossings required ranges of arches supported by piers of enormous height, constituting the most remarkable monuments of ancient civilization. (See AQUEDUCTS.) Small conduits are often made of earthenware pipe. The best earthenware pipes, and particularly the celebrated Scotch pipes, are made from very pure clay mined at great depths, the clays found near the surface of the ground not being found so suitable. The pieces are moulded by hydraulic pressure, and are covered with a vitreous glazing which renders them impermeable to water. These pipes are made in lengths of 2 or 3 feet. The smaller sizes are put together with sockets. Each piece has an enlargement at one end into which the next piece enters, and the joint is made tight by hydraulic cement. The larger sizes are put together with sleeves, which are narrow rings encircling the pipe at each joint, the space between the inside of the sleeve and the outside of the pipe being filled with hydraulic cement. The thickness of earthenware pipes should be about one-twelfth of the diameter. Such pipes have been made as large as 48 inches in diameter. Conduits have been made of wood, but such are not to be recommended. For the first year or two they impart a disagreeable taste to the water, and if not entirely filled with water at all times they decay rapidly. The portions of a conduit subjected to pressure are sometimes made of wrought iron lined with brickwork or cement. The use of wrought-iron pipes without any protection other than a coating of tar or mineral paint originated in California, and has latterly been coming into favor in other parts of the U. S. It may be safely adopted in the case of waters which do not act with energy upon iron. The East Jersey Water Company has laid down a steel-riveted pipe, 48 inches in diameter and 21 miles long, to convey the waters of the Pequannock river to supply municipalities in the vicinity of New York city.

A long and large aqueduct should be provided with gates and discharge-sluices at intervals of a few miles, in order that any section may be emptied for repairs without wasting the entire contents of the aqueduct. The inside of a conduit should be cleaned once or twice a year. This is done with brooms after drawing down the water.

A pumping system usually has a conduit, not essentially different in construction from that required in a gravitation supply, though it ordinarily forms a much less important feature of the system. Its purpose is to convey the water from the source to the pump-well, which can usually be located so as not to require a great length of conduit. In water-works for cities located on the shores of the Great Lakes, and drawing their supply therefrom, the conduit forms a very important feature. The water can not be taken from any point near the shore, as it is liable to be contaminated

by sewage and turbid on account of the action of waves. To procure water free from the latter source of impurity, the conduit must extend a long distance into the lake, as it is only in water of considerable depth that the waves cease to act upon the bottom. A solid structure built into the lake would require the strength and solidity of a breakwater, and even in that case would not be sufficiently permanent and free from settlement to serve as the foundation of an aqueduct. The method adopted at Chicago and other lake cities has been to extend a tunnel under the bottom of the lake to the desired point. The first tunnel built in the U. S. for the supply of water was the one at Chicago, made in 1864–67, under the direction of E. S. Chesbrough, the engineer for the city, who may be regarded as the originator of this method of procuring a supply of water from lakes. This tunnel is about 2 miles long and 5 feet in diameter. A second tunnel, 7 feet in diameter, was built parallel to it in 1872–74. A third, 10 feet in diameter and extending 4 miles into the lake, was brought into use in 1892. Cleveland built a tunnel of this kind over a mile long and 5 feet in inside diameter in 1869–74. See TUNNELS AND TUNNELING.

Distributing or Service Reservoirs.—The supply of water is liable to too many contingencies to be intrusted to a pipe or conduit reaching from the source of supply to the point of consumption. It is always considered judicious, where the topographical conformation admits of it, to provide a reservoir at an elevation corresponding to the pressure required in the distributing-pipes. An elevation of from 100 to 150 feet is usually sufficient for all purposes of domestic supply, and a greater height than 150 feet is not desirable, unless all fittings are made to conform to the increased pressure, as the leakage is increased, and the velocity with which the water moves in the service-pipes often causes them to burst when outlets are suddenly closed. Where fire-engines are to be dispensed with a greater elevation is necessary, as will be noticed further on. Many towns situated on undulating ground have more than one reservoir—a low one for the lower districts, and a high one for the higher. The town of Brighton, England, has four "zones of distribution," with a reservoir for each, the highest being 480 feet above the level of the sea.

In localities where land is not too expensive, reservoirs are usually built entirely of earth. The most suitable site for the construction of a reservoir is an eminence composed of gravel containing such a proportion of clay as to admit of being consolidated by pressure. This is called "binding gravel." The embankments forming the sides of the reservoir are formed of this material very carefully compacted by heavy rollers and by the wheels of vehicles. Such embankments ought to have a slope of 2 base to 1 perpendicular, so that an embankment 25 feet high, assuming it to be 15 feet wide on the top, should be 115 feet wide at the bottom. They are further secured from filtration by a central core or an inner lining of puddle, which is an artificially prepared mixture of clay and gravel in such proportions as to be impermeable to water without being liable to crack when dry. Ledges and abandoned stone quarries have sometimes been chosen as sites for reservoirs, with usually very unsatisfactory results. The rock should always be covered with a thick layer of puddle. The inner slopes of the embankments are usually paved with heavy stone resting on a layer of pebbles or broken stone. This is necessary on account of the waves to which all bodies of water are liable, which would otherwise injure the banks and render the water turbid. Reservoirs in thickly settled parts of towns are generally built of masonry, and are sometimes covered to prevent contamination of the water by dust and smoke. All reservoirs in London within 5 miles of St. Paul's are required by law to be covered, unless the water is subjected to filtration after leaving the reservoir. In open reservoirs the water should not be less than 20 feet deep when full, as vegetation is active at a depth much less than this when exposed to the sun. Modern practice, in fact, calls for much greater depths. Impurities sometimes affect the surface, while the water remains good at the bottom, and *vice versa*, for which reason engineers are accustomed to construct reservoirs so that the water can be drawn from the bottom or otherwise at pleasure. They should also be so arranged that the water will have a circulation through the whole extent of the reservoir, the outlet being at the opposite side from the inlet.

In a pumping system the pipe leading from the pumps to the reservoir is called the force-main. It is usually made a little stronger than other pipes sustaining the same pressure, under the impression that it is liable to greater shocks from the pulsations due to the action of the pumps, though, in reality, the pulsations to which the force-main is liable are probably less violent than is the case with any other part of the system of pipes, especially where, as is the universal practice, it is in free communication with an air-chamber.

Where, from lack of a suitable eminence or from economical considerations, no reservoir is constructed and the water passes from the pump directly into the distributing-pipes, a stand-pipe is often employed to prevent the pulsations due to the action of the pumps from extending to all parts of the distributing system. A stand-pipe is simply a vertical pipe communicating with the force-main, and rising to a height greater than that corresponding to the pressure in the distributing-pipes. It sometimes consists of two pipes communicating with one another at their summits. In this case the pump acts under a constant pressure, the water being all raised to the same height and flowing from one pipe to the other at their summits. In the case of a single pipe the water oscillates according to the varying consumption and the speed of the pumps. A great many small towns have recently adopted stand-pipes which serve, to some extent, the purpose of reservoirs—viz., circular tanks of plate iron 20 feet or more in diameter. These have reservoir capacity sufficient for any sudden emergency, and greatly diminish the difficulty of regulating the speed of the pumps, allowing the latter to stop for longer or shorter periods without interrupting the supply.

The *Holly system* of water-works has neither reservoir nor stand-pipe. The pumps work directly into the distributing-pipes, and when the pumps stop the supply ceases. An automatic device controls the speed of the pumping machinery according to the pressure in the mains. It is claimed that this system maintains a pressure sufficient for domestic purposes at all times, and on the occurrence of a fire the pressure can in a few minutes be raised to a point which will enable the latter to be controlled by streams from the hydrants without the use of fire-engines. In fact, many towns, upon the adoption of this system, have disposed of their movable engines and rely altogether upon hydrants for controlling fires. A fire-alarm, to give notice at the pump-house of the occurrence of a fire, is a part of the system. It is claimed for the Holly system, as an advantage over reservoirs sufficiently elevated to deal with fires, that it works under the high pressure only so long as the fire lasts, while for ordinary purposes it works under a very moderate pressure. This would certainly be a substantial advantage if the pumps worked with the same relative economy in the one case as in the other. This system recommends itself by its low first cost as compared with a reservoir system, but the necessity of keeping the machinery in readiness for fires at all hours of the day and night, with the requisite number of men in attendance, makes the pumping much more expensive than in the reservoir system.

Purification of Water.—For various methods of purifying the water-supply, see WATER.

The distributing system embraces the network of pipes through which the water is conveyed from the reservoir or other central point to all parts of the town. The pipes lying in the common streets and thoroughfares are called mains; those leading from the latter to the premises of consumers are called service-pipes. Distributing mains of wood, lead, stone, earthenware, and asphaltum have been used at various times. The water of London was once distributed in wooden and lead pipes. The water from Jamaica Pond was distributed in Boston in wooden pipes before the introduction of the supply from Lake Cochituate. Wooden pipes, formed of the trunks of straight trees, are still employed for conveying water under slight pressure, as in the supply of farm-buildings. Pipes formed of natural stone, artificially hollowed out, were laid down in considerable quantity in London, and also in Manchester, England, in the early part of the nineteenth century. The result in each case was a disastrous failure. A pipe of sheet iron, coated internally and externally with hydraulic cement, has been extensively used in the U. S. The cement, while it remains intact, very effectually preserves the iron from rusting. These pipes are joined together by means of sleeves of the same material, the void spaces being filled with cement. The cement used in these joints gives such a degree of rigidity to the line of pipes that any settlement of the ground causes cracks. The separation of the cement from the iron at any point is followed by a rapid corrosion of the pipe. This kind of pipe has, in many cases, given satisfaction, though it has frequently failed in connection

with the Holly system of pumping, and is at present little used, on account of the great reduction in the price of cast iron, which, notwithstanding its grave defects, is by far the most reliable and satisfactory material. The most serious defect of cast-iron pipe is the facility with which the metal is acted on by water. The inner surface becomes covered with tubercles or protuberances, sometimes of such size as to diminish the effective diameter of the pipe by as much as 1½, or even 2 inches. In small pipes this action sometimes goes to the extent of closing them entirely. A 3-inch pipe is often so choked that one can not see through it from end to end. Wrought iron is attacked more energetically than cast. The gray variety of cast iron is more readily oxidized than the white. A large proportion of carbon or graphite in the iron accelerates the action. The development of tubercles proceeds most rapidly in the softest and purest waters, the Boston pipes being more rapidly fouled than those of Philadelphia or New York. No method of preventing this action has been discovered, but it may be delayed for many years by a process commonly ascribed to Dr. R. Angus Smith, of Manchester, England. This consists in immersing the pipe in a bath of coal-tar, both the pipe and tar being heated to a temperature of from 300 to 500° F. The pipe remains in the tar some thirty minutes, and on being removed and allowed to cool a very fine coating is formed on the surface of the pipe. This resists the action of the water for a long time, but the tubercles usually appear in the course of ten or twelve years, sometimes much sooner. Pipe thus prepared imparts a slightly tarry taste to the water at first, but it disappears in a year or two. Cast-iron pipes are also liable to another kind of deterioration in certain soils, arising from the action of matters contained in the soil upon the exterior of the pipe. The iron undergoes a remarkable change, being reduced to a substance resembling graphite. The mud of salt-water marshes has this action upon iron in a remarkable degree. Long lines of pipe laid in this material in Boston have been entirely destroyed in the course of fifteen or twenty years. In some places a crowbar, or even a knife, could be thrust through the pipe, and it could be cut with a knife. The pitch coating is thought to be a protection against this kind of decay, but for greater security the pipe should be imbedded in and covered with unobjectionable material. Cast-iron pipes are made in lengths of from 9 to 12 feet. For the purpose of joining them together, one end of each pipe has an enlargement called the bell; the unenlarged end is called the spigot. The inside diameter of the bell is some three-fourths of an inch greater than the outside diameter of the spigot. The spigot of each pipe enters the bell of the preceding pipe to the depth of 3 or 4 inches, and the void space is filled with lead.

Pipes are usually cast in vertical moulds with the bell downward. A more uniform thickness is thus secured than by casting them horizontally. Pieces of peculiar form, called branches, are required where two lines of pipe communicate with one another. Curved pieces are required for changes of direction in a line of pipe, though straight lengths of pipe may be laid to a curve of 400 feet radius. Pipes usually communicate at all street-crossings. This intercommunication gives a great number of routes by which the water may approach any point in case of fire. Hydrants are inserted at intervals of some 200 feet in the more compact parts of towns, 300 or 400 feet in the more sparsely peopled districts. Valves or stop-gates are introduced, so as to divide the whole system into a great number of small sections, any one of which can be isolated from the rest for the purpose of repairs without interrupting the supply to other districts. Rivers and other bodies of water are crossed by pipes provided with a sort of ball-and-socket joint, by means of which the pipe adapts itself to the inequalities of the bottom. Lines of pipe which cross summits of ground are provided at such points with air-cocks, to allow the air inclosed at the summit to escape. Air lodges at such points when the pipe is filled after having been emptied for any cause. Air is also, under some circumstances, disengaged from the water itself, and accumulates at the summits of pipes.

The depth to which pipes are covered varies with the climate. In different parts of England from 2 to 3 feet is considered to afford sufficient protection from frost. In St. Paul, Minn., 7 and 7½ feet are found sufficient. In the adjacent city of Minneapolis, which has a very loose gravelly soil, the pipes are laid 8 feet deep, and give great trouble from freezing. In Montreal the authorities are content with a depth of 6 feet, though much trouble is experienced from frost. In Quebec the pipes are laid 8 and 10 feet deep.

Service-pipes are generally from ½ to 1½ inches in diameter. They are most commonly composed of lead, or of wrought iron prepared in various ways to resist corrosion. From a mechanical point of view lead pipe has peculiar fitness for this use. It is procurable in any desired length, easily attached to mains and fittings, easily divided and bent to suit the various situations. These advantages have led to its employment for service-pipes more than any other material, notwithstanding the fact that it is liable to impart poisonous qualities to the water. (See WATER.) A service-pipe of wrought iron, lined internally with hydraulic cement, has been much used, and appears to be eminently well fitted for the purpose. The most important precaution to be observed in the introduction of service-pipes is to secure protection from frost. The pipe usually passes from the main directly into the cellar. In houses having open areas, it is hardly possible to secure sufficient depth. The pipe is usually provided with a cock just inside the cellar wall, by which the water can be shut off and discharged from the portion within the cellar, as city cellars are rarely frost-proof. Freezing usually takes place at or near the cellar wall. For this reason the pipe is often so made that it can be separated at this point and thawed out by injecting hot water through a long small pipe. A service-pipe should, by preference, enter at the sunny side of a house, as the ground freezes less deeply there. See also AQUEDUCTS, PLUMBING, and SEWERAGE.

Cost of Pumping.—The unit of cost of pumping water is the cost of pumping 1,000,000 gal. 1 foot high. The performance of a steam pumping-engine, or what is called its "duty," is the weight of water that it can raise to a height of 1 foot with 100 lb. of coal. Many recent engines have shown an experimental duty of 100,000,000 lb. It is doubtless practicable to work permanently with a duty of 75,000,000, which is equivalent to raising 9,000,000 gal. of water to a height of 1 foot, or, what is the same thing, 1,000,000 to a height of 9 feet. At this rate, with coal at 25 cents per 100 lb., the cost of coal to raise 1,000,000 gal. 1 foot high would be a little less than 3 cents. The other items of cost are the expense of attendance, oil, waste, kindling-wood, etc.

Where the engine works to one-third, one-fifth, or one-tenth its full capacity, the cost of attendance and repairs cuts a large figure in the cost of each million gallons pumped. In a cheap and poorly constructed engine, the cost of repairs often is very great. The most economical results are obtained with a first-class engine working to its full capacity. Suppose such an engine pumps 5,000,000 gal. a day to a height of 200 feet. The total cost for attendance and incidentals would not exceed $10 a day, being 1 cent a million gallons raised 1 foot. Adding 1 cent for ordinary repairs, the total cost of raising 1,000,000 gal. 1 foot is 5 cents. It is very seldom that this degree of economy is attained. Six cents is a first-class result, and 10 is probably not above the average, where interest and depreciation are considered. In pumping by water-power 2 cents is about the average cost.

J. P. FRIZELL.

Watkin, Sir EDWARD WILLIAM, M. P.: b. in Manchester, England, about 1815; was trained to the mercantile business by his father, with whom he became a partner; became one of the directors of the Manchester Athenæum in 1839, organized its celebrated literary *soirées* in Free Trade Hall, and in 1843 led in the inauguration of the Saturday half-holiday; became director and manager of several important railways, especially the Intercolonial of Canada; visited the U. S. and Canada on railway business 1851 and 1861; was for some time president of the Grand Trunk Railway of Canada; was influential in securing the confederation of British North America, for which he was knighted 1868; and has been prominent in Parliament as a supporter of reforms in financial legislation. He promoted and accomplished the extension of the Manchester, Sheffield, and Lincolnshire lines, giving a new entrance into London. In 1890 he laid out a site at Wembley Park, near London, where he proposed to build a tower that would surpass the Eiffel Tower. The first story was built, but the work was suspended in 1894 for want of funds. He is an ardent supporter of the project of tunneling under the English channel, and has accomplished a considerable amount of work in that direction, but has been unable to obtain sanction for its completion from the Government.

Watkins: village; capital of Schuyler co., N. Y.; on Seneca Lake, and the North Cent. and the Fall Brook rail-

ways; 22 miles N. of Elmira (for location, see map of New York, ref. 5–F). It is in an agricultural and grape-growing region; is chiefly noted for its famous Glen (see WATKINS GLEN); and has several mineral springs, the Glen Springs Sanitarium, one of the largest salt-making plants in the State, an academy, 2 public libraries, 2 private banks, 3 weekly newspapers, several iron-foundries, carriage-factories, and flour and saw mills. Pop. (1880) 2,716; (1890) 2,604; (1900) 2,943. EDITOR OF "EXPRESS."

Watkins Glen: a picturesque ravine in western central New York, near the head of Seneca Lake. Its beautiful scenery attracts thousands of visitors annually. The lake region of Western New York is underlain by a great body of shale belonging to the Devonian system. During the Pleistocene period the face of the country was much modified through erosion by glacial ice, and some of the north-south valleys were converted into deep troughs with smooth, steep sides. After the melting of the ice a new drainage system was established, and many small streams flowing down the sides of the troughs carved out deep, narrow ravines, sharply contrasted in character with the troughs. They are barely wide enough to hold the streams which flow through them in time of flood; their walls are precipitous, and they contain many cataracts. Of these Watkins Glen is the most celebrated. G. K. G.

Watling's Island: a small island of the Bahamas, E. S. E. of Cat island, and a little outside of the line formed by most of the group; crossed by lat. 23° 56′ N. and lon. 74° 28′ W. It is fertile, but has few inhabitants. In the center there is a lagoon. Most prominent authorities are now agreed that this was Guanahani, the first American island seen by Columbus and called by him San Salvador. When the explorer's track is traced back from Cuba, the position of Watling's agrees better with that sought than does Cat island or any other, and a lagoon as mentioned in the narrative is found only here. Among those who have accepted Watling's island as the probable landfall are Muñoz, Capt. Becher, Peschel, Richard H. Major, Lieut. J. B. Murdoch, and Markham. In 1891 an expedition led by Walter Wellman, in the interests of the Chicago *Herald*, visited the waters of the West Indies in order to determine exactly where the first landfall made by Columbus was. After carefully following in his track as laid down in Las Casas's abridgment of Columbus's *Journal* or log-book, Wellman decided in favor of Watling's island, and there placed a tablet with this inscription: "On this spot Christopher Columbus first set foot upon the soil of the New World. Erected by the Chicago *Herald*, June 15, 1891." H. H. S.

Watse'ka: city; capital of Iroquois co., Ill.; on the Iroquois river, and the Tol., Peoria and West. and the Chi. and E. Ill. railways; 75 miles S. of Chicago, 100 miles E. of Peoria (for location, see map of Illinois, ref. 4–G). It is in an agricultural region, and has 6 churches, 3 public-school buildings, a national bank with capital of $50,000, a private bank, 3 weekly papers, 3 tile-factories, 2 grist and flour-mills, knitting-mill, and planing-mill. Pop. (1880) 1,507; (1890) 2,017; (1900) 2,505. EDITOR OF "REPUBLICAN."

Watson, HEWETT COTTRELL, F. L. S.: botanist; b. at Firbeck, England, in May, 1804; son of a magistrate; educated at the University of Edinburgh; author of *Outlines of the Geographical Distribution of British Plants* (1832; new ed. 1835); *The New Botanist's Guide to the Localities of the Rarer Plants of Great Britain* (2 vols., 1835–37); *The London Catalogue of British Plants* (6th ed. 1867); *Cybele Britannica, or British Plants and their Geographical Relations* (4 vols., 1847–60), and of a *Supplement* (1863) and a *Compendium* (1870) of the same work. D. at Thames Ditton, July 27, 1881. Revised by CHARLES E. BESSEY.

Watson, JAMES CRAIG, LL. D.: astronomer; b. in Elgin County, Ontario, Canada, Jan. 28, 1838, of American parents, who soon afterward settled in Michigan; graduated at the University of Michigan 1857; became teacher of mathematics there, and assistant at the observatory; was appointed Professor of Astronomy 1859, of Physics and Mathematics 1860; became director of the observatory in 1863; discovered twenty-three asteroids; went to Iowa in 1869, and to Sicily in 1870, to observe the eclipses of the sun, and in 1874 was the head of the very successful American expedition which observed the transit of Venus at Peking, China. In 1867 he was elected a member of the National Academy of Sciences. For his discovery of six asteroids in one year he was in 1870 awarded the Lalande gold medal of the French Academy of Sciences. He contributed to many scientific journals, prepared various astronomical charts, and was author of *A Popular Treatise on Comets* (1860) and *Theoretical Astronomy, relating to the Motions of the Heavenly Bodies revolving around the Sun* (1868). D. at Madison, Wis., Nov. 23, 1880.

Watson, JOHN, M. A., LL. D.: professor of philosophy; b. in Glasgow, Scotland, Feb. 25, 1847. He was educated in Glasgow University, and was appointed Professor of Moral Philosophy in Queen's University, Kingston, Canada, in 1872. His principal works are *Kant and his English Critics* (New York, 1881); *Schelling's Transcendental Idealism* (Chicago, 1882); *The Philosophy of Kant as contained in Extracts from his own Writings* (New York, 1888); *Comte, Mill, and Spencer* (New York, 1895). J. M. B.

Watson, JOHN, A. M., D. D.: Presbyterian minister and author; b. of Scottish parents at Manning-tree, Essex, England, in 1850; was educated at Edinburgh University (1866–70); studied theology at New College, Edinburgh, and at Tübingen, Germany; ordained minister of the Free church in Logicalmond, Perthshire (the *Drumtochty* of his stories), in 1875; collegiate minister of St. Matthew's Free church, Glasgow, 1877–80, when he was called to Sefton Park Presbyterian church, Liverpool. In 1893 he began writing under the name of *Ian Maclaren*. Is author of *Beside the Bonnie Brier Bush* (1894); *Auld Lang Syne* (1895); *Kate Carnegie*, *The Mind of the Master*, and *The Cure of Souls* (1896), the last being lectures delivered at Yale University in 1896, when he lectured extensively in the U. S.

Watson, JOHN CRITTENDEN: See the Appendix.

Watson, MUSGRAVE LEWTHWAITE: sculptor; b. at Hawkdale, near Carlisle, England, 1804; educated at Raughton School; spent several years in a law-office; went to London 1824; studied sculpture in private, aided by the friendly counsel of Flaxman; spent several years (1825–28) in Rome; became an assistant to Chantrey, whom he soon left on account of his haughty manners, and to Behnes; was employed by New College, Oxford, to execute from Chantrey's models the fine group of Chancellors Eldon and Stowell now in the library of University College; made statues of Queen Elizabeth (for the Royal Exchange), Flaxman, Allan Cunningham, Nelson, *Hebe and Iris*, a bas-relief of the *Burial of Sarpedon*, a statuette of Chaucer, and the model for the bas-relief of the battle of St. Vincent for the Nelson column. D. in London, Oct. 28, 1847. R. S.

Watson, RICHARD: clergyman; b. at Barton-upon-Humber, Lincolnshire, England, Feb. 22, 1781; printed at the age of nineteen an *Apology for the People called Methodists*; was ordained 1800; soon afterward joined the Methodists of the New Connection, but returned to the Wesleyan body 1812, and became secretary of its missionary society 1817. D. in London, Jan. 8, 1833. He was the author of *Theological Institutes* (6 parts, 1823–28); *The Life of the Rev. John Wesley* (1831); *A Biblical and Theological Dictionary* (1831); *An Exposition of the Gospels of Matthew and Mark* (1833), and other theological treatises, collectively republished with *Memoir of his Life* (13 vols., 1834–37).

Watson, ROBERT SPENCE: See the Appendix.

Watson, SERENO, M. D., Ph. D.: botanist; b. at East Windsor Hill, Conn., Dec. 1, 1826; graduated at Yale College 1847, and at the medical department of the University of New York; was botanist to the geological exploration under Clarence King 1868–69; assistant in the Gray herbarium, Harvard College, 1871; curator Gray herbarium 1888–92. In 1889 he was elected to the National Academy of Sciences. His principal publications are *Botany* (vol. v. of the U. S. Geol. Explor. of the 40th Parallel, 1871); *Bibliographical Index to North American Botany* (1878); *Contributions to American Botany* (1873–91). D. Mar. 9, 1892.

Watson, THOMAS: poet; b. in London, England, about 1557; educated at Oxford University; studied law in London; spent some time in Paris with members of the Walsingham family; settled in London, and acquired a high reputation by his pastoral and amatory poems, which rivaled in popularity those of his friends Spenser and Sidney. D. in 1592. He was the author of a translation of Sophocles's *Antigone* into Latin (1581); *Ekatompathia, or Passionate Centurie of Love* (1582); *Melibœus, sive Ecloga in Obitum Domini Francisci Walsinghami* (1590); *The Tears of Fancie, or Love Disdained* (1593); and many other poetical works, some of which have perished. The three last named were carefully edited by Edward Arber in his *English Reprints*

(1870). Watson's love sonnets, many of which were imitations of Ferraboseo, Ronsard, and other foreign poets, were artificial and frigid. Revised by H. A. Beers.

Watson, William: poet; b. at Wharfedale, Yorkshire, England, in 1855; educated at private schools. In 1876 he contributed to the Liverpool *Argus* his first poems and a series of articles on German musicians. A year or two after this he removed to Southport. His first volume of poems, *The Prince's Quest* (1880), attracted little attention. *Epigrams of Art* (1884) was favorably reviewed. In 1885 he contributed to the *National Review* a series of sonnets, *Ver tenebrosum*, attacking the policy of the British Government in Egypt. His *Wordsworth's Grave and other Poems* (1891) and his tribute to Tennyson entitled *Lachrymæ Musarum* (1892) first gave full evidence of his powers, especially in elegiac poetry and in verse of a thoughtful, reflective character on literary themes. His obituary poem on Tennyson came under the notice of Mr. Gladstone, and the poet received a civil pension from the Government of £200, which has since been increased. Among his other publications are *Poems* (1893); *Excursions in Criticism* (1893); *The Eloping Angels* (1893); and *Odes and Other Poems* (1894). See *Note on a New Poet*, by Grant Allen, *Fortnightly Review*, lvi., 196. Henry A. Beers.

Watsontown: borough (incorporated in 1867); Northumberland co., Pa.; on the Susquehanna river, and the Cent. Penn. and W. and the Penn. railways; 9 miles N. of Lewisburg, 23 miles S. of Williamsport (for location, see map of Pennsylvania, ref. 4–G). It is in an agricultural region; contains 5 churches, 9 graded schools, 2 national banks with combined capital of $110,000, a tannery, saw and planing mills, car-shops, 2 table and furniture works, and shoe and nail factories, and has a weekly newspaper. Pop. (1880) 1,481; (1890) 2,157; (1900) 1,898. Editor of "Record and Star."

Watsonville: city; Santa Cruz co., Cal.; on the Pajaro river, and the Southern Pac. Railroad; 20 miles E. S. E. of Santa Cruz, and 5 miles from Monterey Bay, Pacific Ocean (for location, see map of California, ref. 8–C). It is in a sugar-beet and fruit-growing region, and has 6 churches, 4 State banks with combined capital of $170,000, a daily and 3 weekly newspapers, and a beet-sugar factory with beet-crushing capacity of over 1,000 tons and sugar-manufacturing capacity of 200 tons a day. Pop. (1880) 1,799; (1890) 2,885; (1900) 3,085. Editor of "Pajaronian."

Watt, James, LL. D., F. R. S.: inventor; b. at Greenock, Scotland, Jan. 19, 1736; manifested in childhood great mechanical ingenuity, having constructed an electrical machine at the age of fourteen; spent some time at Glasgow (1754–55), learning to make mathematical instruments; practiced this trade at London 1755–56; returned to Glasgow; was appointed instrument-maker to the university; studied French, German, and music; constructed an organ; obtained the friendship of Adam Smith and other eminent men; began about 1758 a series of experiments on steam as a motive power, along with his friend Robison, afterward Professor of Natural Philosophy in Glasgow; constructed a model high-pressure steam-engine 1761, a second much improved model 1765, a third 1768; took out a patent Jan., 1769, on his separate condenser for steam-engines; occupied himself for some years with land-surveying, the engineering of the Forth and Clyde and the Caledonian Canals, building bridges, improving the navigation of the Clyde and the harbors of Glasgow and Greenock; became in 1773 a partner with Matthew Boulton, founder of the famous Soho works, near Birmingham, where in 1775 they began the manufacture of steam-engines, which were rapidly improved by the addition of new features. He was also the inventor of various devices unconnected with the steam-engine. He retired from business in 1800, and died at Heathfield, Aug. 25, 1819. He was buried beside Boulton in Handsworth church, a statue by Chantrey was erected in Westminster Abbey by national subscription, and a copy in bronze stands in front of the Manchester Infirmary. See J. P. Muirhead's *Origin and Progress of the Mechanical Inventions of James Watt* (3 vols., 1854); Thurston's *History of the Growth of the Steam Engine* (New York, 1879); and *Lives* by Muirhead (1858), Smiles, and Lord Brougham.

Watt's inventions in connection with the Newcomen engine, the improvements upon which constitute his claim for distinction, have made that machine the prime mover of the world. He adapted it to its original purpose, the pumping of water from mines, etc., gave it enormously greater economy in use of steam and fuel than it had in the hands of Newcomen, and applied it to the rotation of a shaft, and thus made it applicable to the driving of every sort of machinery, thereby making possible the steamship, the steam locomotive, the modern railway, and the whole system of manufacturing industries. These improvements consisted mainly in the invention of the separate condenser, the steam-jacket, and the double-acting engine. His first improvements were directed toward the improvement of the engine by reducing its wastes of steam "by keeping the cylinder as hot as the steam which entered it," as he stated his plan. This reduction of the internal wastes—the largest by far of all the losses of energy in the engine of his time—gave the world the modern "Cornish engine," the most economical of its class and time, and only recently superseded by the compound pumping-engine. Watt proposed to adapt his engine to the propulsion of the steamboat and of the locomotive on the railway; but his time and thought and energies were completely taken up with the work of improving and introducing the stationary engine in its various fields; and that work was left to other inventors. His patent of 1784 embodies a considerable number of inventions, accessories of the steam-engine proper, as the governor, steam-gauge, and water-gauge, which were essential to its successful use. Revised by R. H. Thurston.

Watt, Robert: physician and bibliographer; b. in Ayrshire, Scotland, May, 1774; was in early life a farm-laborer and cabinetmaker; studied at Glasgow University 1793–97, and later studied medicine in Edinburgh; was licensed to practice surgery and pharmacy 1799; resided as a surgeon at Paisley 1799–1810; removed to Glasgow in the latter year, and lectured there on surgery with great success, becoming physician to the Glasgow Infirmary and president of the faculty of physicians and surgeons of that city. D. at Glasgow Mar. 12, 1819. He was the author of several medical treatises, and of an important work, *Bibliotheca Britannica, or a General Index to British and Foreign Literature* (Edinburgh, 4 vols. 4to, 1821–24), published after his death by his sons John and James Watt, who had aided him in the work. Revised by H. A. Beers.

Watteau, Fr. pron. *vaă'tō'*, Antoine: painter; b. at Valenciennes, France, Oct. 10, 1684. He went to Paris in absolute destitution while a boy, and was employed by an artist named Métayer, then with Claude Gillot, a scene-painter, and afterward with a far more able man, Claude Audran. Two pictures of military subjects, painted when he was about twenty-one years of age and preserved only in engravings, excited attention and enabled him to pursue his studies in a more formal way. About 1717 he was received into the Academy of Fine Arts, and as every person so received comes in as the representative of some particular branch of art, he was designated as *Peintre des Fêtes Galantes*, which might be translated a "painter of court pastorals." This title was afterward given to other artists. He had early developed a most elaborate system of painting, which may be described as painting the whole picture in middle tints and then adding touches, sometimes of more vivid color and sometimes of high light, the ground painting showing between the new touches and giving great harmony and the effect of brilliant color, while yet there is but little pure red, blue, etc. As a technical artist Watteau ranks very high, there are few more consummate workmen, and painters generally love his pictures. As regards his subjects, he seldom abandoned the general one denoted by his Academy title. There are always parties of richly dressed women distributed in groups in shaded groves, elegant picnics, country processions, masked balls, and courtly scenes of all sorts. In 1720 he went to England, where he lived for a year, but, his health failing, he returned to France and died July 18, 1721, at Nogent-sur-Seine. The Louvre has one large picture, *L'Embarquement pour Cythère* (Embarkation for the Island of Cythera); and in the collection of La Caze, *Gilles*, *l'Indifférent*, and *Finette*. There is nothing by him in the National Gallery, but in the Dulwich Gallery, near London, are two very beautiful pictures. He is represented also in Edinburgh National Gallery, the Berlin Museum, the Dresden Gallery, and the Hermitage, near St. Petersburg.
Russell Sturgis.

Watterson, Henry: journalist; b. in Washington, D. C., Feb. 16, 1840. Owing to defective eyesight he was educated privately, but at the age of eighteen entered the profession of journalism in Washington, D. C., where he became connected with *The Democratic Review* and *The States*. In 1861 he went to Nashville, Tenn., and there edited *The*

Republican Banner. At the beginning of the civil war he entered the Confederate army, and served in various capacities; performed staff duty 1861–63, and later was chief of scouts in Gen. Joseph E. Johnston's army. After the war he resumed the editorship of the *Banner*; but he soon settled in Louisville, Ky., where in 1867 he became editor of *The Louisville Journal*, succeeding George D. Prentice. In 1868 the *Journal* was consolidated with *The Louisville Times* and *The Louisville Courier* to found *The Louisville Courier-Journal*, of which he became part owner and editor-in-chief. He served as a Democratic member of Congress from Aug., 1876, till Mar., 1877, and has been a delegate to national Democratic conventions, presiding in 1876 over the one held in St. Louis, Mo. As a public speaker, especially on political subjects, he is well known. In addition to contributions to periodicals he published *Oddities of Southern Life and Character* (Boston, 1883).

MARCUS BENJAMIN.

Wattle-bird: the *Anthochœra carunculata*, so named from the large wattles on its neck. It is a native of Southern Australia, of large size and bold, active habits, living on the honey and insects it obtains from the flowers of species of *Banksia*, which cover the waste lands of that region. It has a loud, disagreeable note. It is about the size of a magpie, grayish brown above, each feather striped and bordered with white, the tail brown, long, wide, and graduated. It is hostile to other birds. The yellow wattle-bird, *A. inauris*, is a gregarious bird of Australia, of some importance for the excellent oil which it abundantly affords.

Wattle-turkey: a name sometimes applied to the brush-turkey or *Talegalla lathami* of Australia. See BRUSH-TURKEY and MEGAPODIDÆ.

Wattmeters: instruments for measuring the power expended in electric circuits. The unit of power in the C. G. S. system is the watt. It is equal to 10^7 ergs per second. One horse-power is equivalent to 746 watts. A kilowatt is 1,000 watts, and is equal to about $1\frac{1}{3}$ horse-power.

If a direct current is measured in amperes, and the electromotive force or electric pressure in volts, then the product of the two represents the power of the electrical current in watts. Thus an arc lamp requiring 10 amperes and 45 volts difference of potential between its terminals absorbs 450 watts of energy, or $\frac{3}{5}$ths of a horse-power. A 110-volt incandescent lamp, taking one-half an ampere, requires 55 watts to maintain it at normal candle-power. If it gives light equal to 16 candles, it requires very nearly 3·5 watts per candle.

With direct currents the power can be determined by measuring the current and the voltage and taking their product. But with alternating currents, in which the current and electromotive force do not arrive at their maximum values at the same instant—in other words, where the two differ in phase—the power can not be measured in the same simple way. It is necessary to have an instrument which takes into account the product of the instantaneous values of the electric current and the electric pressure, and integrates or sums up all these products throughout a complete period of the alternating current.

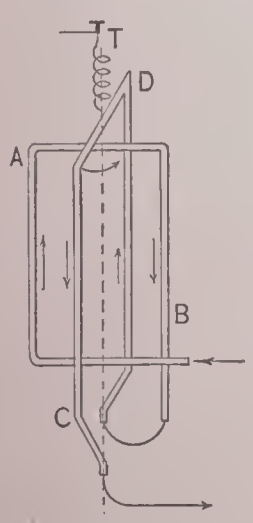


FIG. 1.

Wattmeters are either indicating or integrating. The former indicates the rate at which work is being done at any instant; the latter registers the energy consumed during any interval of time, as, for example, a month.

Indicating Wattmeters.—The principle of the electro-dynamometer, illustrated in Fig. 1, is employed in the wattmeter. It consists of two coils of wire, A B and C D, the first fixed and the second movable. When a current passes through the two in series the movable coil is displaced by the dynamic action between parallel currents, and it turns in the direction of the arrow. It may be brought back to its zero position by turning the torsion head, T, or the deflection may be read by means of an attached pointer. When the same current traverses both coils, the force of deflection is proportional to the square of the current, since the doubling of the current in either coil doubles the force.

If now the fixed coil be traversed by the main current and the suspended coil be separately connected as a pressure coil to the terminals of the resistance or translating device, in which the power expended is to be measured, then the mutual force between the two coils will be proportional at any instant to the product of the two currents—that is, to the product of the working current and the electric pressure.

In Fig. 2 the fixed coil F F carries the entire current passing through the translating device T, such as a lamp, while the movable coil P is connected to the mains on opposite sides of T. The instrument can then be calibrated so that its scale shall read directly in watts or kilowatts. In the diagram the pressure current is also carried round the field coil, but in a direction opposite to the main current. The object is to make a correction for the current passing through the pressure coil, for this also passes through the field coil in addition to the current actually required to operate the electrical device T. The third terminal I is employed only for calibrating purposes with currents from independent sources.

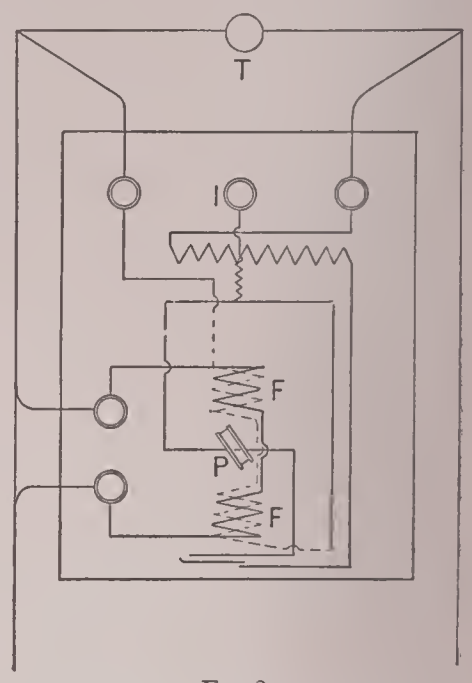


FIG. 2.

An instrument operating on this principle can be used either with direct or alternating currents, since the forces tending to turn the movable system are the same whether the currents both go in one direction through the coils or in the other. If only one of the currents be reversed, the couple tending to turn the system is also reversed. This is as it should be, since the instrument then takes account of the fact that when an alternating current and electromotive force differ in phase, during a part of each period the circuit is absorbing power from the source, and during the remainder of the period it is returning power to the source, since the direction of the electromotive force relative to the current is then reversed. When the two are in the same direction the source is giving energy to the circuit, but when they are in opposite directions the circuit is returning energy to the source. The same relations exist in a flywheel, in which there is a give and take of energy as the speed changes. During an increase of speed the flywheel absorbs energy, but during a decrease of speed it gives out energy to run the system or to aid the source. The deflection of the wattmeter will be due to the difference of these two opposite actions.

Recording Wattmeters.—Recording wattmeters give the integrated energy expended during any period of time. They are strictly energy-meters. The principle may be explained by a description of the Thomson wattmeter, which received the highest prize at Paris in competition with all others.

It consists of a vertical shaft resting in a jeweled bearing and carrying near its upper end an armature of several coils without an iron core. These coils are connected to the bars of a small commutator near the upper bearing of the shaft, and on this commutator rest two light springs. The coils are wound with many turns of fine wire, and in series with them is a high non-inductive resistance at the back of the instrument (Fig. 3). The field coils of this motor are the two large coils clearly shown in the figure. An endless screw on the shaft engages with a wheel in the registry-train, and the rotations of the armature are thus recorded on the dials.

On the lower part of the shaft is mounted a copper disk which rotates between the poles of three permanent magnets. Currents are generated in the disk by its motion, and the device constitutes a magnetic damper for the regulation of the rotation so as to make the speed proportional to the energy to be registered.

The armature is connected to the circuit as a pressure coil, and the field coils are in series with the translating

device. The torque operating the motor is made up conjointly of the two magnetic fields, due to the current in the field-coil on the one hand and the current proportional to the electric pressure on the other. The speed of rotation

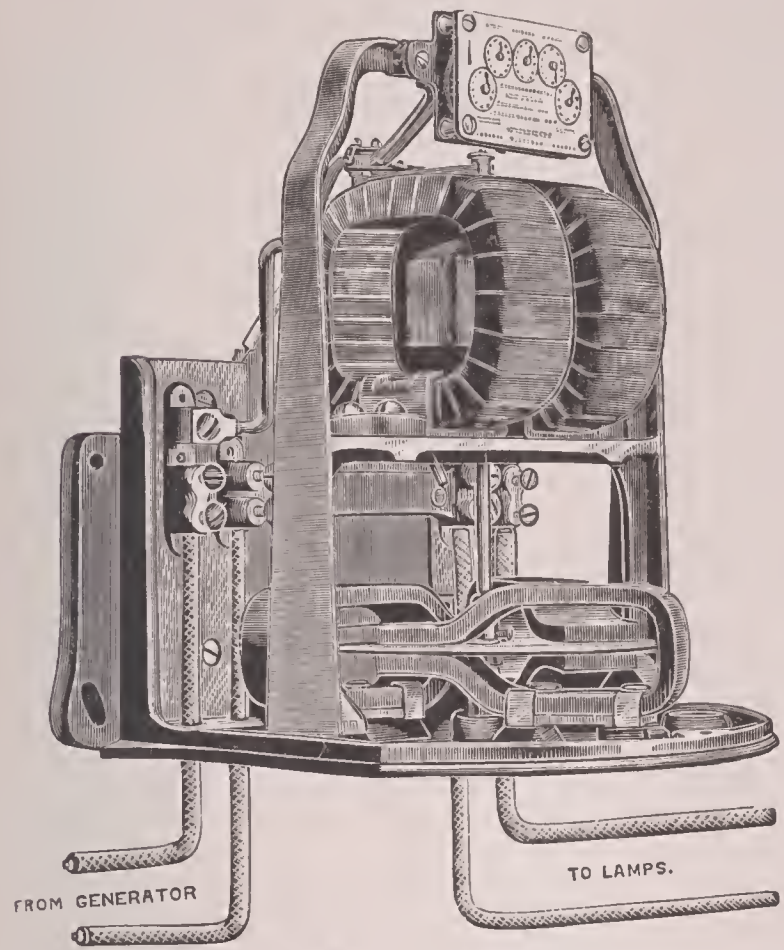


Fig. 3 —Two-wire meter (low capacity).

therefore takes into account not only the variations of the current in the mains, but those of the electric pressure as well. In an ordinary electric motor the speed decreases as the field is made stronger, but in this motor the speed increases directly with the field strength. This difference is explained by the fact that the counter electromotive force is very small in comparison with the resistance of the armature circuit, so that the current through the armature is not affected by the speed, which therefore increases with the field current, as in the case of a series motor on a constant-current circuit. The efficiency of the device as a motor is sacrificed to secure the qualities required in a registering meter.

In this instrument, as in the indicating wattmeter, a reversal of either current with respect to the other reverses the torque on the armature. This wattmeter therefore takes account of both the absorption and the restoration of the energy, or registers the difference between the output and the intake of energy.

The Aron wattmeter, which has been used to some extent in Germany, operates in a very different manner. Two clocks, adjusted to run normally at the same rate, are mounted in the same case. The pendulum of one ends in a coil of fine wire carried by a suitable fork, in such a manner that it can oscillate back and forth along the axis of another larger fixed coil. The movable coil is connected as a pressure coil, and the fixed coil as a main circuit coil. The rate of this clock is therefore determined by the mutual action of the two coils, and its variation is proportional to the product of the electric pressure and the main current. The gain of the measuring pendulum is then a measure of the energy which has been absorbed. Both clocks act on the same dial train, so that the dials register numbers which a constant of the instrument converts into watt-hours.

Henry S. Carhart.

Watts, Alaric Alexander: journalist; b. in London, England, Mar. 16, 1799; became a teacher at Putney and at Manchester; published a successful volume of *Poetical Sketches* (1822); was successively editor of the Leeds *Intelligencer*, the Manchester *Courier*, and the London *Standard*; founded and conducted for ten years the *United Service Gazette* 1833–43; consumed his property by six chancery suits with his partner in that enterprise; edited a series of annual volumes, *The Literary Souvenir* (1825–35); published his selected poems, *Lyrics of the Heart* (1851); and received in 1853 a pension of £100 a year. D. at Kensington, Apr. 5, 1864. See the *Life* by his son (2 vols., 1884).

Revised by H. A. Beers.

Watts, George Frederick, D. C. L., LL. D: figure and portrait painter; b. in London in 1817; studied at the Royal Academy (where he first exhibited in 1837), and later in Florence, and in 1847 won a prize of £500 in London for a cartoon representing *Alfred Inciting the Saxons to Prevent the Landing of the Danes*, which is now in one of the committee-rooms of the Houses of Parliament; has painted important frescoes in Lincoln's Inn and other buildings in London; is also a sculptor. He is, however, known chiefly as a portrait painter, some forty of the most distinguished men in Great Britain having sat to him, and by his imaginative compositions, one of which, *Love and Life*, exhibited at the Columbian Exposition in Chicago in 1893, was presented to the U. S. Government and is now on exhibition in Washington. He was elected a Royal Academician in 1868, received first-class medals at the Paris Exposition of 1878, and at that of Antwerp in 1885; received the decoration of the Legion of Honor in 1878. A collection of his works was exhibited at the Metropolitan Museum, New York, in 1884–85, and attracted considerable attention. Studio in London.

William A. Coffin.

Watts, Henry, F. R. S.: chemist; b. in London, England, Jan. 20, 1815; received a thorough scientific education, and became a teacher, but, owing to an incurable impediment in his speech, was unable to obtain a professorship and became editor of the journal of the Chemical Society in 1850 and librarian in 1861; translated Gmelin's *Handbook of Chemistry* (18 vols., 1848–55) for the Cavendish Society. His best claim to distinction is his *Dictionary of Chemistry* (5 vols., 1863–68; Supplements in 1872, 1875, 1881; new edition by Morley and Muir, 4 vols., 1889–94). D. in London, June 30, 1884.

Watts, Isaac: hymn-writer; b. at Southampton, England, July 14, 1674; son of a Nonconformist schoolmaster, by whom his early education was directed; studied at the Southampton free school and at Rev. Thomas Rowe's Dissenting academy in London; became a private tutor at Stoke Newington in 1696; became in 1698 assistant minister and in 1702 pastor of the Mark Lane Independent congregation, London; was forced by ill health in 1712 to retire from the active work of the ministry, and having gone on a visit to his friend Sir Thomas Abney, at Theobald's, Newington, was persuaded to remain there indefinitely as a guest, and so continued for thirty-six years, until his death Nov. 25, 1748. He was buried in Bunhill Fields. Watts was of diminutive size and somewhat deformed in person, and was never married. He had a high reputation as a preacher, and was much beloved for his cheerfulness, his wit, and his truly philosophical traits of character. He was the author of *Logic, or the Right Use of Reason in the Inquiry after Truth* (1725), *The Improvement of the Mind* (1741), and many volumes of religious and educational treatises, but is best remembered by his *Psalms and Hymns*, which has ever since contributed largely to the services of song in nearly all branches of English-speaking Protestant denominations. Monuments have been erected to his memory in Abney Park and Westminster Abbey, a statue by Chantrey was dedicated at Southampton in 1861, and the foundation of a memorial hall was laid there May 6, 1875. His *Complete Works* were edited by Drs. Jennings and Doddridge (6 vols., 1754), and biographical sketches have been written by Dr. Johnson, Milner, and Southey. Revised by H. A. Beers.

Watts, Robert, D. D.: Irish Presbyterian minister, professor, and author; b. at Moneylane, County Down, Ireland, July 10, 1820; educated at the Royal Academical Institution of Belfast, Lafayette College, Pennsylvania, Washington College, Virginia, and Princeton Seminary; was founder and pastor of Westminster church, Philadelphia, 1852–63; assistant secretary of the Presbyterian board of education, Philadelphia, 1860–63; pastor of Gloucester Street church, Dublin, 1863–66; and since 1866 Professor of Systematic Theology in the Assembly's College, Belfast. Besides contributing frequently to theological and scientific reviews, Dr. Watts has published *Calvin and Calvinism* (Edinburgh, 1866); *Utilitarianism* (Belfast, 1868); *What is Presbyterianism?* (1870); *Prelatic Departures from Reformation Principles* (Edinburgh, 1871); *Arminian Departures from Reformation Principles* (Edinburgh, 1871); *Atomism* (Belfast, 1874); *Herbert Spencer's Biological Hypothesis* (1875);

The Doctrine of Eternal Punishment (Belfast, 1877); *The New Apologetic* (Edinburgh, 1879; revised ed. 1890); *The Newer Criticism* (Edinburgh, 1882); *The Rule of Faith and the Doctrine of Inspiration* (London, 1885); *The Reign of Causality* (Edinburgh, 1888); *Dr. Briggs's Theology Traced to its Organific Principle* (1891); and *Driver's Introduction Examined* (1892). C. K. HOYT.

Watts, THOMAS HILL: Governor of Alabama; b. in Butler co., Ala., Jan. 3, 1820; graduated at the University of Virginia 1840, and began the practice of law at Greenville, Butler co., 1841; was member of the State Legislature 1842–45; moved to the city of Montgomery, and was again elected to the Legislature in 1849, becoming a member of the State Senate in 1853; was strongly opposed to the policy of secession, but cast his fortunes with his State; first entered the Confederate military service as colonel of a regiment, but after the battle of Shiloh (Apr., 1862), where he greatly distinguished himself, resigned to take the position of Attorney-General in President Davis's cabinet. He became Governor of Alabama in 1863, but was deposed from this office under the reconstruction policy of the Federal Government. He afterward continued the practice of law in Montgomery. D. in that city Sept. 16, 1892.

Wat Tyler: the leader of the peasants' revolt in the reign of Richard II., King of England. For many years the discontent of the peasants had been gathering. The Statute of Labourers (1349) fixing the maximum of wages, the teachings of Wycliffe and of the itinerant preacher John Ball, arousing hostility to the clergy and discontent with existing social conditions, and the attempts to force the emancipated workingmen to return to the condition of villeins, had combined to develop in the peasantry a spirit of revolt. Finally, the expenses of the lingering war with France having exhausted the ordinary revenues, the Parliament assembled at Northampton imposed a poll or capitation tax (Nov., 1380) on each male or female above the age of fifteen years. This was rigorously enforced, and became the occasion of disturbances in several places. At Dartford, in Kent, a laboring man, one Walter or Wat, known as "the Tiler" from his occupation, struck dead a tax-collector, whom he accused of gross insult to his daughter, early in June, 1381, and calling his neighbors to shield him from punishment, soon found himself at the head of a considerable multitude; and the excitement spreading over the nine southeastern counties, a march against London was determined on for the redress of grievances. A vast mob, usually said to have numbered 100,000, marched on London, and took possession of the southern portion of the city. The king met one division of this force, composed chiefly of the Essex peasantry, at Mile End on June 14, 1381, and by fair promises induced them to return home. The other body, composed of the men of Kent, burned the Duke of Lancaster's palace, plundered a portion of the city, seized the Tower, put to death the lord treasurer, Sir Robert Hales, and the Archbishop of Canterbury, destroyed the Savoy Palace, the archbishop's palace, and the priory of St. John's, Clerkenwell, and advanced to Smithfield (June 15), where they were met by some of the authorities, with the young king at their head. In the parley which ensued the arrogance of Wat was so great that Sir William Walworth, the lord mayor of London, rushed upon him and killed him on the spot. Richard declared to the excited mob that he would be their leader himself, and actually conducted them out of the city. On the following day they were attacked by Sir William Knollys, dispersed, and their leaders mercilessly punished. Seven thousand are said to have been killed in fight or executed after the revolt was suppressed, and as the king was false to his promises the movement failed of its immediate object. F. M. COLBY.

Waugh, EDWIN: dialect-writer; b. at Rochdale, Lancashire, England, Jan. 29, 1817; educated at the commercial academy of that place; was apprenticed to a bookseller and printer; worked at his trade as a journeyman nearly ten years; was then appointed secretary to the Lancashire public school association for the promotion of a national plan of secular education; filled that post five years, and then devoted himself entirely to literature, having by his cultivation of the dialect of his native county won the designation of the Lancashire poet. He was the author of *Sketches of Lancashire Life and Localities* (1855; 4th ed. 1869); *Poems and Lancashire Songs* (1859; new ed. 1870); *Rambles in the Lake Country and its Borders* (1862); *Tufts of Heather from the Lancashire Moors* (1864); *Irish Sketches*; *Home Life of the Lancashire Factory-Folk* (1866); *Sancho's Wallet*, a series of northern anecdotes; *The Chimney Corner*, a series of country tales (1879); *Roads out of Manchester*; *The Limping Pilgrim*; and other works. In 1882 he received a pension of £90 from the civil list. D. at New Brighton, Cheshire, Apr. 30, 1890. A selection from his poems appeared under the title *Poesies frome a Country Garden* (2 vols., 1865). A complete edition of his writings in ten volumes was issued at Manchester in 1881–83.
Revised by H. A. BEERS.

Wauke'gan: city; capital of Lake co., Ill.; on Lake Michigan, and the Chi. and N. W., and the Elgin, Joliet and East. (Belt Line) railways; 36 miles N. of Chicago, 50 miles S. of Milwaukee, Wis. (for location, see map of Illinois, ref. 1–G). It is on a bluff 80 feet above and overlooking the lake, has a deep, improved harbor and a fine beach, and is a shipping point for iron, lumber, salt, and coal. Many Chicago business men have summer and permanent residences here. The city is in an agricultural region; has a public park, improved water-works, paved streets, high school, public library, a national bank with capital of $50,000, a State bank with capital of $50,000, and a daily and three weekly newspapers; and is principally engaged in the manufacture of railway supplies, barbed wire, plumbers' hardware, zinc oxide, feather dusters, builders' hardware, starch, carriages and wagons, leather and machinery. Pop. (1880) 4,012; (1890) 4,915; (1900) 9,426. F. T. RADECKE.

Waukesha, waw'kē-shaw: village; capital of Waukesha co., Wis.; on the Fox river, 5 miles from its source (Pewaukee Lake), and on the Chi. and N. W., the Chi., Mil. and St. P., and the Wis. Cent. railways; 20 miles W. of Milwaukee, 98 miles N. of Chicago (for location, see map of Wisconsin, ref. 7–F). It is one of the principal health resorts in the State, has magnesian springs that are recommended for kidney and liver diseases, and is connected with Pewaukee Lake by electric railway. The village has gas and electric-light plants, water-works, county, town, and village buildings, 9 churches, 5 public schools, Roman Catholic and Lutheran parochial schools, Carroll Academy (a classical and scientific school), the Wisconsin Industrial School for boys, 2 national banks with combined capital of $200,000, and 3 weekly newspapers. There are quarries of dolomite building-stone, railway-car shops, several flour-mills, 2 breweries, malleable iron plant, and cast-iron works. Pop. (1880) 2,969; (1890) 6,321; (1900) 7,419. THERON W. HAIGHT.

Waukon': town; capital of Allamakee co., Ia.; on the Chi., Mil. and St. P. Railway; 18 miles W. of the Mississippi river (for location, see map of Iowa, ref. 2–J). It is in an agricultural and fruit-growing region; contains 7 churches, high school, convent school, business college, public library, a national bank with capital of $50,000, and 2 State banks with combined capital of $65,000; and has 2 newspapers, several flour-mills, wagon-factories, creamery, and canning-factory. The town is an important market for live stock. Pop. (1880) 1,350; (1890) 1,610; (1900) 2,153.
EDITOR OF "STANDARD."

Waupa'ca: city (chartered in 1875); capital of Waupaca co., Wis.; on the Waupaca river, and the Wis. Cent. Railroad; 40 miles N. W. of Oshkosh, 135 miles N. W. of Milwaukee (for location, see map of Wisconsin, ref. 5–E). It is in an agricultural region, has excellent water-power, contains the State Soldiers' Home, and has 2 national banks with combined capital of $100,000, 2 weekly newspapers, several foundries and flour-mills, woolen-mill, and potato-starch factory. The city is a summer resort with many attractions, including a chain of picturesque lakes. Pop. (1880) 1,392; (1890) 2,127; (1900) 2,912.
EDITOR OF "REPUBLICAN."

Waupun': city; Fond du Lac and Dodge cos., Wis.; on the Chi., Mil. and St. P. Railway; 18 miles S. W. of Fond du Lac, 68 miles N. W. of Milwaukee (for location, see map of Wisconsin, ref. 6–E). It is in an agricultural region; contains 9 churches, 2 public high schools, the State prison, and a national bank with capital of $50,000; and has 2 weekly newspapers, manufactories of carriages, pumps, windmills, cigars, umbrellas, cane goods, and, in the prison, shoes. Pop. (1880) 2,353; (1890) 2,757; (1900) 3,185.
PROPRIETORS OF "LEADER."

Wausau, waw'saw: city; capital of Marathon co., Wis.; on both sides of the Wisconsin river, and on the Chi. and N. W. and the Chi., Mil. and St. P. railways; 40 miles N.

of Stevens Point, 180 miles N. W. of Milwaukee (for location, see map of Wisconsin, ref. 4–D). The surface has a gradual ascent from the river on both sides. The city is provided with numerous parks, paved streets, electric lights, and water-works with reservoir capacity of 3,000,000 gal. per day, and has 3 banks with combined capital of $260,000 and deposits exceeding $1,000,000, and a daily and 6 weekly newspapers. Among the notable buildings are the county courthouse (cost $100,000), the county insane asylum (cost $125,000), and the city-hall (cost $25,000). There are 19 churches, viz.: Methodist Episcopal, Roman Catholic, German Lutheran, and Presbyterian, 2 each; and German Methodist, Baptist, German Baptist, Norwegian Lutheran, Swedish Lutheran, Evangelical Lutheran, Evangelical, Apostolic Evangelical, German Reformed, Protestant Episcopal, and Universalist, 1 each. The educational institutions comprise 10 public schools, with 48 teachers and 2,300 pupils, and 2 Roman Catholic and 3 Lutheran parochial schools, with a total enrollment of about 700. The annual tax levy is $65,000; receipts from water rent and licenses, $25,000; expenditures, $90,000; bonded debt, $165,000; and assessed valuation, $3,530,000. Business interests include about 40 manufacturing plants, which employ about 1,800 people. There are 6 large sawmills, 2 flour-mills, 3 box-factories, several planing-mills, 2 quartz sand-mills, 2 tanneries, 7 cigar-factories, extensive granite quarries, furniture-factory, wood-novelty works, boiler-works, and other plants. Wausau was settled in 1842; was first known as Big Bull Falls, because of the falls in the river here; and was first given railway accommodations in 1874. Pop. (1880) 4,277; (1890) 9,253; (1900) 12,354.

EDITOR OF "CENTRAL WISCONSIN."

Wau'seon: village; capital of Fulton co., O.; on the Lake Shore and Mich. S. Railway; 12 miles N. of Napoleon, 33 miles W. by S. of Toledo (for location, see map of Ohio, ref. 1–D). It is in an agricultural region, 12 miles from the Maumee river; is an important trade center; and has electric lights, large public school, 2 private banks, 2 large flour-mills, public library, and 3 weekly newspapers. Pop. (1880) 1,905; (1890) 2,060; (1900) 2,148.

EDITOR OF "REPUBLICAN."

Wanters, *vō'tērz*, ÉMILE: historical and portrait painter; b. in Brussels, Nov. 29, 1846; pupil of Portaëls in Brussels, and of Gérôme in Paris; received second-class medals at the Salons of 1875 and 1876, and medals of honor at the Paris Expositions of 1878 and 1889; received the decoration of the Legion of Honor (1878), and of the Orders of Leopold of Belgium and Francis Joseph of Austria; member of Brussels, Vienna, and Madrid Academies. *Madness of Hugh Van der Goes* is in the museum, and *Citizens of Brussels demanding the Constitution of Duke John IV.* in the city-hall at Brussels. His studio is in Brussels. W. A. C.

Wave-lengths: See WAVES.

Wavellite: a mineral, a hydrous aluminium phosphate, named after Dr. Wavell (d. 1829), who discovered it in Cornwall, England. It occurs near Bellows Falls, N. H.; at the Washington mine, Davidson co., N. C.; and in York and Chester cos., Pa. It is found usually in radiated spheroidal masses of white or yellow-green or brown color, translucent, harder than calcite, approaching fluor; crystal-system, right-rhombic.

Wave-motion: See WAVES.

Wave-offerings: in the Hebrew ritual, those offerings which were borne by the offerer upon his hands before the priest and were *waved* by the priest moving the offerer's hands in a horizontal direction. Most commonly, doubtless, this ceremony took place at the offering of private peace-offerings (Lev. vii. 29–34), but it also occurred in connection with the offerings enjoined at the consecration of priests (Ex. xxix. 24, 26), the dedication of Nazarites (Num. vi. 20), the jealousy-offering (Num. v. 25), the trespass-offering of the leper (Lev. xiv. 12), and at the offering of the sheaf of new grain at the Passover (Lev. xxiii. 11), and the loaves of first ripe grain and peace-offering lambs at the Feast of Weeks (Lev. xxiii. 17–20). The meaning of the rite is plain when it is noticed that the parts waved were almost exclusively those parts of the sacrifices which were allotted to the priests as a gift from Jehovah. The swinging forward meant the presentation to God, the swinging backward God's return of the gift for the use of his priest (*Oehler*). SAMUEL MACAULEY JACKSON.

Waverley Novels: See SCOTT, SIR WALTER.

Waverly: village (founded in 1836): Morgan co., Ill.; on the Jacksonv., Louisv. and St. L. and the St. L., Chi. and St. P. railways; 19 miles E. S. E. of Jacksonville, the county-seat, and 25 miles S. W. of Springfield (for location, see map of Illinois, ref. 7–C). It is in an agricultural and dairying region, and has 8 churches, graded schools, 3 private banks, a weekly newspaper, creamery, tile-works, and several flour-mills and grain elevators. Pop. (1880) 1,124; (1890) 1,337; (1900) 1,573. EDITOR OF "JOURNAL."

Waverly: city; capital of Bremer co., Ia.; on the Cedar river, and the Burl., Ced. Rap. and N., the Chi. Gt. West., and the Ill. Cent. railways; 12 miles N. of Cedar Falls, 28 miles S. E. of Charles City (for location, see map of Iowa, ref. 3–I). It is in a dairying and stock-raising region, contains Wartburg College (Lutheran), and has 6 churches, graded public schools, 20 creameries and cheese-factories, creamery-supply factory, furniture-factory, a national bank with capital of $100,000, a State bank with capital of $50,000, a loan and trust company with capital of $25,000, and 4 weekly newspapers. Pop. (1880) 2,345; (1890) 2,346; (1900) 3,177. EDITOR OF "INDEPENDENT."

Waverly: village; Tioga co., N. Y.; on the Chemung river, and the Del., Lack. and W. and the Erie railways; 18 miles E. S. E. of Elmira, 19 miles W. S. W. of Owego (for location, see map of New York, ref. 6–F). It is the shipping-point for a large agricultural and dairying region; has electric lights and electric railways connecting the city with Sayre and Athens, Pa.; and has a union school, several grammar and primary schools, 5 churches, town-hall, opera-house, a national bank (capital $50,000), a State bank (capital $50,000), and 3 weekly papers. Pop. (1880) 2,767; (1890) 4,123; (1900) 4,465. EDITOR OF "TRIBUNE."

Waverly: village (laid out in 1829); capital of Pike co., O.; on the Scioto river, the Ohio Canal, and the Norfolk and Western and the Ohio Southern railways; 16 miles S. of Chillicothe, 29 miles N. of Portsmouth (for location, see map of Ohio, ref. 7–E). It is in an agricultural and stock-raising region, and has a private bank, 3 weekly newspapers, union school, saw, flour, and planing mills, furniture-factories, tannery, and distilleries. Pop. (1880) 1,539; (1890) 1,567; (1900) 1,854.

Waves [deriv. of the verb *wave* < O. Eng. *wafian*, waver, hesitate: Icel. *vāfa*, vibrate]: the forms assumed by parts of an elastic medium whose particles are in a state of oscillation—that is, move to and fro within certain limits. In certain kinds of waves the particles move in the direction in which the wave is propagated. Of this kind are sound-waves in the air, water, etc. (See ACOUSTICS.) In waves of light, radiant heat, and electro-magnetic vibrations which take place in the ether, the oscillations are transverse to the line of propagation. (See LIGHT.) This article is divided into two parts, the first treating of waves in ether, and more especially of light-waves and their lengths, and the second of the different kinds of waves on the surface of sheets of water.

I. WAVES IN ETHER.

The sensation of light is, in general, produced as the consequence of some phenomenon going on at a distance, e. g. a candle burning or a gas heated to incandescence. The process by which this effect is carried across the intervening space is now known to be a succession or train of waves. This is perfectly analogous to the result produced on the shores of a pond of water when waves are caused by the dropping of pebbles into the middle of the pond, or to a sound being heard by means of waves in the air, which are sent out by a distant horn. In all wave-motions the individual particles of the medium through which the waves are passing merely vibrate to and fro; the *form* alone advances. In the case of light we know, further, that the waves are not in ordinary matter like air or glass, but are in a medium called ether, which permeates all space, and which is present between the smallest portions of ordinary matter. Molecules of matter act like so many obstacles in the ether, loading it and hindering the free passage of the ether-waves.

All waves are characterized by certain properties. The length of a wave is the distance between two consecutive points where the state of the motion is identically the same, or, as ordinarily expressed, it is the distance from crest to crest or from hollow to hollow. The frequency or wave-number is the number of "crests" which pass by any fixed point in one second of time. When a train of waves passes from the free ether into the ether which has ordinary

matter immersed in it—e. g. when light passes from a vacuum into air or glass, or when it passes from one kind of matter into another—the wave-length is changed, owing to the influence of the molecules of matter; but the frequency remains unchanged. So the frequency is the permanent characteristic of a train of waves. The length of the wave is characteristic only for a given medium under definite conditions. The frequency, however, can not be measured directly, whereas the wave-length can; but in expressing the values for wave-lengths care must be taken always to define the conditions under which they are measured.

These ether-waves may be produced in many ways. Every portion of matter is sending them out as the result of molecular vibrations, which can be increased or decreased by the application or withdrawal of heat. Any oscillating electric charge or current also causes them. It is found by experiment that these waves may have various lengths, ranging from $\frac{15}{1000000}$ths of a centimeter to a distance measured in kilometers, and that different effects are produced by different waves. If they have lengths lying between $\frac{40}{1000000}$ths and $\frac{80}{1000000}$ths of a centimeter—i. e. if they are about $\frac{1}{50000}$th of an inch long, they produce on the retina of the eye the sensation of light. The shortest visible waves give rise to the sensation violet; the longest, the sensation red; those of intermediate length, the sensations blue, green, yellow, etc. Waves slightly longer than these visible ones may be detected by their heating effect or by their influence on phosphorescent bodies. Waves much longer may be measured by electrical appliances. Waves shorter than the visible ones produce certain chemical reactions, and may be measured by photographic means.

Apart from purely theoretical reasons, the chief interest in the determination and knowledge of wave-lengths of ether-waves depends upon two facts.

1. A luminescent vapor or gas is emitting trains of waves of definite frequencies, which are characteristic of the substance in a given condition. And since the frequencies are definite, so are the wave-lengths for any specified medium. The light coming from any source, when analyzed into separate trains of waves by a prism or grating, is said to form its spectrum. Thus copper vapor has a characteristic spectrum; hydrogen, another, etc.

2. A vapor can absorb—i. e. prevent passing—waves having the same frequencies as those it would emit if it were more incandescent. So, if on the examination of any light certain waves which are characteristic of some known vapor are shown to be wanting, it is evident that the light must somewhere on its course have passed through a comparatively cool layer of this vapor.

Owing to the importance of these facts, measurements have been made of the wave-lengths in the spectra of all known substances; and the spectra of all possible sources of light, such as the sun, comets, etc., have been carefully studied to see whether certain waves are present. With the apparatus and methods in use great accuracy can be obtained, and the information thus acquired is of great use. The purity of any chemical element may be tested by heating it or otherwise rendering its vapor luminescent, because the smallest trace of impurity would make itself known by emitting its characteristic waves. The composition of many chemical substances can be easily learned by a study of the spectra emitted. New elements or substances may be discovered, or the existence of new compounds proved, if spectra are observed which are not characteristic of other substances. Much can be learned about the constitution of the sun, the planets, and many of the stars. If the light is examined which comes from the sun, it is found that many waves are absent, whereas if the sun were simply a white-hot solid mass there would be none missing within certain limits. Further, experiments prove that, almost without exception, all these waves which are absent are exactly those which would be emitted by incandescent vapors of certain known substances. This proves, then, that these vapors must form an atmosphere around the immensely hot nucleus of the sun, and thus demonstrates the existence in the sun of the substances producing the vapors. A further study of the solar spectrum, and a comparison of it with the spectra of known elements under known conditions, furnishes considerable information about the temperature of the sun, and about the successive layers of vapors which surround the nucleus. Similarly, a study of the spectra of the stars, planets, comets, and nebulæ supplies accurate information about their history, their temperature, and condition. In certain cases there are slight differences between the wave-lengths of the vapors as known here on the earth and those which appear due to the same vapors in the spectra of the stars or planets. These discrepancies may be due to two causes: One is a possible difference between the pressure or temperature of the vapor on the star or planet and that of the vapor as produced on the earth. The other is the possible motion of the star or planet toward the earth, or away from it. If it is approaching the earth, more waves are crowded into a given space than would naturally be there, and so the distance between two crests—i. e. the wave-length—is lessened by a certain amount. Similarly, if the star is receding from the earth, the wave-length will be increased. These changes in the wave-length can be measured, and, as a rule, it is not difficult to determine their exact cause. See SPECTRUM, SUN, and STARS.

A noted application of the properties of waves and their lengths has been made by Prof. Albert A. Michelson, of Chicago, in comparing the international standard of length, the centimeter, with the wave-length of a particular kind of light. The centimeter is the $\frac{1}{100}$th portion of the length of a certain metal rod which is kept in Paris, when the rod is at the temperature of melting ice. This is a perfectly arbitrary length, and the bar is liable to accident and to slight changes. So far as is known the frequency of any train of waves sent out by a definite vapor under definite conditions is a fixed, unalterable quantity. Consequently the wave-length of these waves when passing through any definite medium is also a fixed quantity, and thus affords a fixed standard of length which is liable to no change and which can easily be measured anywhere on the earth's surface and at any epoch of time. Prof. Michelson has made a comparison of the length of the standard bar in Paris with the wave-length of a certain train of waves emitted by cadmium vapor, the external conditions being, of course, accurately determined and noted, so that, even if the standard bar be destroyed or injured, the centimeter can be accurately constructed and restored by laying off a definite number of wave-lengths of light.

It is found that wave-lengths may be measured to a degree of accuracy that limits the error to less than one part in 200,000. The method in universal use is to compare the wave-lengths of the spectrum under investigation with those previously observed and measured. By determining the differences between these wave-lengths and using a method of interpolation, the desired quantities can be found. In order to have certain wave-lengths which can be used as standards, many observations and measurements have been made and recorded. The most reliable method in use is one which depends upon the knowledge of some one standard wave-length, and upon the comparison of the others with this one by means of micrometric measurements. This method is due to Prof. Henry A. Rowland, of Baltimore, and is based upon the use of a concave grating, the properties of which were discovered by him. The standard wave-length now universally adopted is that of 5896·156 Ångström units (such a unit being $\frac{1}{10000000}$th of a centimeter) for that one of the waves due to sodium vapor which is called D_1 when the vapor is in the condition it is on the sun and when the wave-length is measured in air at 20° C. and a pressure of 76 cm. of mercury. The scale of wave-lengths which is based upon this standard is ordinarily known as Rowland's scale. The most accurate measurements of wave-lengths have been made by Rowland, working in Baltimore, and by Kayser and Runge, in Hanover, Germany. Rowland has given especial attention to the wave-lengths in the solar spectrum and in the spectra of certain elements. Kayser and Runge have made no observations on the solar spectrum, but have made a most careful study of the spectra of the elements. They have measured with the greatest care the wave-lengths characteristic of each element, and have sought to find mathematical relations between the waves of any one spectrum, and also between the waves of the spectra of different elements. Their investigations show that a careful comparison of wave-lengths throws considerable light upon the structure of molecules and upon their modes of vibration. There are two classes of spectra which even a superficial inspection shows to be subject to some simple mathematical law. One is the so-called fluted or band spectrum, which is illustrated by the spectra of carbon, nitrogen, water-vapor, and a great many compound substances. The other is the line spectrum of hydrogen or others similar to it. Groups of waves like the hydrogen series are common to sodium, zinc, cadmium, and other elements. The wave-lengths of the waves forming a band

spectrum obey an exceedingly simple mathematical law, which can be thus expressed:

$$\frac{1}{\lambda} = a + bn^2,$$

where λ is the wave-length; a and b are constant numbers for any one band; and n is each one in turn of the series of numbers 0, 1, 2, 3, etc. This law was discovered almost simultaneously by several physicists who were engaged on spectrum-work, but it was first published by Deslandres, and is sometimes called by his name. It can, however, be regarded as only a first approximation, for Kayser and Runge have shown that the law which best expresses the wave-lengths of certain bands is

$$\frac{1}{\lambda} = a + be^{cn} \sin dn^2,$$

where a, b, c, d, e are constants; and n is in turn each one of the integer numbers.

The wave-lengths of the waves forming the hydrogen spectrum obey a law which is quite different. It was discovered by Balmer in 1885, and is sometimes called Balmer's law. It may be expressed thus:

$$\lambda = \lambda_0 \frac{n^2}{n^2 - 4},$$

where λ is the wave-length; λ_0 is a certain constant; and n is in succession each one of the numbers 3, 4, 5, 6, etc. It was noticed by many observers that there were several substances whose spectra bore a close resemblance to that of hydrogen, but Kayser and Runge were the first to make any systematic study of them. They succeeded in finding a simple modification of Balmer's formula, which would quite well express the law of distribution for the wave-lengths of all these spectra which have groups or series analogous to the hydrogen one. Their law may be written:

$$\frac{1}{\lambda} = A + Bn^{-2} + Cn^{-4}$$

where λ is the wave-length; A, B, and C are constants characteristic of any one series of wave-lengths; and n is in turn each one of a series of integer numbers.

Besides this simple arrangement of waves in bands or series there are many other mathematical relations which have been discovered and elaborated, notably by Kayser and Runge and Rydberg. If the spectrum of any substance—e. g. carbon or nitrogen—contains several bands, not alone do the individual wave-lengths of each band obey Deslandres's formula, but the bands themselves are also distributed according to the same law. In the spectra of many elements which contain series like the hydrogen one, the waves which form the members of the series are double or triple. (The sodium spectrum contains a series of doubles; the zinc spectrum, a series of triples, etc.) It has been shown that for any one series the difference between the frequencies of the two (or three) waves forming the double (or triple) is a constant quantity. Further, applying Kayser and Runge's formula—

$$\frac{1}{\lambda} = A + Bn^{-2} + Cn^{-4}$$

—to the spectra of the elements which form a group of allied chemical substances, such as zinc, cadmium, and mercury, or magnesium, calcium, and strontium, it is found that the constants A, B, and C follow certain general numerical laws.

It is interesting to note that by the use of these mathematical relations Kayser and Runge and Rydberg have been able to predict the existence of certain waves in the spectra of certain elements; and these predictions are all being gradually verified. Their chief importance, though, lies in the fact that by means of them some knowledge of the structure of molecules may perhaps be finally obtained.

JOSEPH S. AMES.

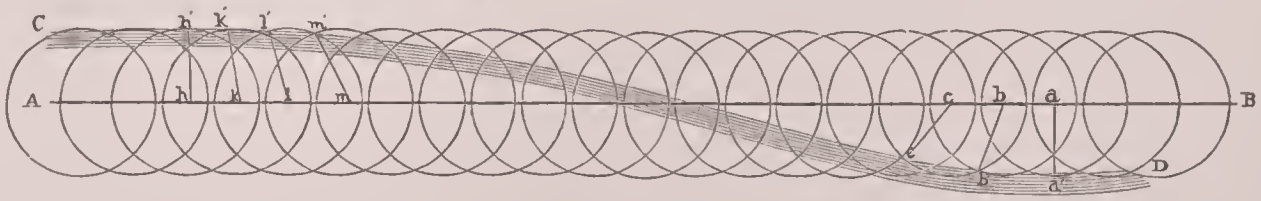
II. WAVES IN WATER.

Water is distinguished from solid bodies by its mobility—that is, by the freedom with which its elementary particles move with reference to one another. It results from this mobility that a disturbance communicated to particles of water at any point becomes the occasion of disturbance to contiguous particles, and through these to particles more remote, propagating itself in this manner to great distances in the form of oscillatory movements called *waves*.

The physical characters of waves are familiar to all. A stone dropped into standing water is followed by a series of circular ridges, spreading till they reach the shore or become so indistinct as to escape observation. Upon the great ocean the phenomenon presents itself on a grander scale. The crests of waves attain at times a height of 30 feet and move with the velocity of a railway passenger-train. During a first sea-voyage, upon observing such liquid hills approaching the vessel with such a velocity, it is difficult to divest one's self of the impression that the latter is in danger of being shattered to fragments. Yet it receives but a moderate shock, and is lifted with a movement which, to the voyager who is accustomed to it, is not even unpleasant. Were the mass of water moving with the velocity of the wave, the effect upon vessels would be disastrous, as is readily seen in the rapidity with which a stranded vessel is broken up when exposed to the full force of the waves. The character of the wave is here so changed by the shelving ground that the water has a rapid movement.

In a body of water the movement of any particle is controlled by the proximity of other particles. No particle can move without occasioning a movement of other particles, and it can move only in such a manner as is consistent with the movement of the entire mass. Each particle moves in a closed orbit around its position of rest, returning to the same position at regular intervals. This fact can be verified by observation. If the effect of waves upon a small body floating in the water is noted, it will be seen that the latter is not carried along by the wave. When the crest of the wave passes the body it moves a short distance in the direction of the wave-motion; when it is in the hollow of the wave it moves slightly in the opposite direction. If a float which gradually sinks in the water is watched, it will be found that these movements are not confined to the surface, but extend as deep as the observation reaches. The particles of water move forward rising and sinking, and return sinking and rising, describing a closed orbit, but whether this orbit is circular or elliptical can not be learned by observation. Mathematicians who have investigated this subject find that in water of very great depth the orbit of each elementary particle is an exact circle whose center is in the position occupied by the particle when at rest. These circular orbits are greatest at the surface of the water, being there equal in diameter to the height of the wave. They diminish rapidly farther down, so that when the water at the surface has a movement of 20 feet, causing waves 20 feet high from trough to crest, it has at a depth of 50 feet a movement of only 7 feet, and at a depth of 200 feet a movement of not more than 4 inches.

The figure below shows how the circular movements of the different particles of water combine to produce the undulations of the surface which we call waves. A B is the surface of the water when at rest. The circles are the orbits of the particles at the surface, which for a wave moving leftward are supposed to be in motion in a direction opposite that of the hands of a clock. The particle h', whose position of rest is h, is at the highest point of its orbit; the next particle to the right, k', whose position of rest is k, is slightly past the summit of its orbit, and farther to the right each particle is in a little more advanced position than the one preceding. The particle a', whose position of rest is a, is at the lowest point of its orbit. The surface of the water at the instant under consideration is represented by the curved line C D, h' being the highest point or crest of the wave, a' the lowest point or trough of the wave. The motion continuing, the crest advances toward the left, and when the particle h' has reached the lowest point of its orbit that point becomes the trough of the wave, and a', having then reached the highest point of its orbit, is the crest of the succeeding wave. The horizontal distance between the crests of two consecutive



Waves.

waves is called the length of the wave. The particles of water which when at rest lie all in the same vertical line, constituting a vertical filament of water, all arrive during wave-motion at the summits of their orbits at the same instant. The orbits diminish in diameter downward, so that at a depth of a few hundred feet the movement practically ceases. The lower part of the filament remains immovable and its upper part bends like a stalk of wheat in a field under the action of the wind. When the crest of the wave coincides with the filament, the latter is erect and elongated. It then bends in the direction of the wave's motion and returns to its erect position when the trough of the wave passes. It is then shortened and thickened. It then bends in the direction opposite to that of the wave's motion, and so on.

The form of the wave is cycloidal, but it is not the common cycloid, which is a curve traced by a point on the circumference of a circle rolling upon a straight line. Were this the case, the height of the wave would bear the same proportion to its length that the diameter of a circle bears to its circumference; whereas there is not necessarily any definite relation between the height and length of the wave. In the same system of waves the same relation between the height and the length will always be found; but a slight change in the direction or intensity of the wind gives rise to a different system in which a different relation exists. Different systems of waves often occur at the same time. It is a matter of common observation at the seashore that at intervals a wave occurs much higher than the preceding. This arises from the coincidence of two waves belonging to different systems. To the same cause is due the "seas" which break over the decks of vessels during storms, carrying away everything not securely fastened.

The velocity of a wave depends upon its length. To find this velocity when the length is known, the radius of a circle whose circumference is the length of the wave is first found. Designating this radius by r, the velocity is the same that a heavy body would acquire in falling freely through a height equal to one-half r. To find the radius of the orbit of a particle at a given depth below the surface, divide the given depth by r, and find the number of which this quotient is the natural logarithm. Divide r by this number, and the quotient will be the radius sought. Waves in deep water usually arise from the action of the wind, and their motion when unobstructed is in the same direction as the wind to which they owe their origin. How powerfully the wind acts in acceleration of the molecular movements to which waves are due will appear upon a little reflection. The elevated part of the wave is fully exposed to the action of the wind, and here the particles of water are moving in the same direction as the wind. The trough of the wave, in which the particles are moving in the opposite direction, is mainly screened from the action of the wind by the neighboring crest. When the wind begins to blow while the water is smooth, it might appear difficult to understand how it can originate waves, since the wind would seem to exert a uniform pressure upon all parts of the surface. The wind, however, never acts with a perfectly uniform and steady pressure. There is always enough of inequality to cause a ruffling of the surface, and the minute waves, once formed so as to present a surface to the direct action of the wind, are rapidly increased in magnitude. They continue to increase until they have attained a velocity nearly equal to that of the wind.

The tendency of waves is to form in long lines at right angles to the direction of the wind. This tendency is the more marked in proportion as the expanse of water is unlimited and the wind unvarying in force and direction. It is rare, however, that an opportunity is obtained to observe the phenomenon of waves in its entire simplicity. Under the most favorable circumstances the eye can follow the wave longitudinally but a very short distance. Neither, if one fixes the eye upon the crest of a wave and endeavors to follow its movement, can it be traced to any great distance before it disappears and a new wave arises. The more common case is a system of waves caused by a local wind, crossed in different directions by other systems originating in distant parts of the ocean, and by waves reflected from the shore, the whole often forming a tumultuous commotion of waters, in which scarcely any law of movement can be recognized. This shows that different simple movements of the elementary particles may coincide and superpose themselves upon one another in all conceivable ways.

The preceding refers to waves in deep water—that is, water so deep that the bottom exerts no influence upon the movements of the elementary particles. These move in precisely the same manner as though the depth were infinite. Hence the preceding is called, for distinction, the theory of waves in water of infinite depth. In water of moderate depth the proximity of the bottom exerts an influence the more marked in proportion as the depth is less. Where the depth is considerable, this influence manifests itself in a slight horizontal movement of the water at the bottom. As the depth diminishes, this horizontal movement increases, until finally, at slight depths, the particles have the same horizontal movement at the bottom as at the surface, while the vertical movement is greatest at the surface and diminishes to nothing at the bottom. The particles thus move in orbits which are often nearly circular at the surface, and become more and more flattened toward the bottom, where they are simply straight horizontal lines. The most important difference between waves in infinite depth and those in finite depth is that in the former the velocity with which the wave travels appears to have no relation to the depth, depending solely upon the magnitude of the wave; whereas in the latter the velocity depends upon the depth, being, according to the most trustworthy observations, equal to that velocity which a heavy body acquires by falling freely through a height equal to half the depth, measured from the top of the wave.

J. Scott Russell, an English marine engineer, made very extended and valuable researches upon the subject of waves. These researches were undertaken at the instance of the British Association for the Advancement of Science, and the results are detailed in a provisional report made to the association in 1837, and published in its *Transactions* for 1837, and a more complete report in 1844. The following are some of the conclusions arrived at: (1) The existence of a *great primary wave* of fluid, differing in its origin, its phenomena, and its laws from the undulatory and oscillatory waves which alone had been investigated previous to the researches of Mr. Russell, has been confirmed and established. (2) The velocity of this wave in channels of uniform depth is independent of the breadth of the fluid, and equal to the velocity acquired by a heavy body falling freely by gravity through a height equal to half the depth of the fluid, reckoned from the top of the wave to the bottom of the channel. (3) The velocity of this primary wave is not affected by the velocity of impulse with which the wave has been originally generated: neither does its form or velocity appear to be derived in any way from the form of the generating body. (4) This wave has been found to differ from every other species of wave in the motion which is given to the individual particles of fluid through which the wave is propagated. By the transit of the wave the particles of the fluid are raised from their places, transferred forward in the direction of the motion of the wave, and permanently deposited at rest in a new place at a considerable distance from their original position. There is no retrogradation, no oscillation: the motion is all in the same direction, and the extent of the transference is equal throughout the whole depth. Hence this wave may be descriptively designated *the great primary wave of translation*. The motion of translation begins when the anterior surface of the wave is vertically over a given series of particles; it increases in velocity until the crest of the wave has come to be vertically above them; and from this moment the motion of translation is retarded, and the particles are left in a condition of perfect rest at the instant when the posterior surface of the wave has terminated its transit through the vertical plane in which they lie. This phenomenon has been verified up to depths of 5 feet. (5) The elementary form of the wave is cycloidal; when the height of the wave is small in proportion to its length, the curve is the prolate cycloid; and as the height of the wave increases, the form approaches that of the common cycloid, becoming more and more cusped until at last it becomes exactly that of the common cycloid with a cusped summit; and if by any means the height be increased beyond this, the curve becomes the curtate cycloid, the summit assumes a form of unstable equilibrium, the summit totters, and, falling over on one side, forms a crested wave or breaking surge. (6) A wave is possible in forms of channel where the depth is not uniform throughout the whole breadth. . . . In the sloping or triangular channel the velocity is that due to one-third of the greatest depth. In a parabolic channel the velocity is that due to three-eighths or three-tenths of the greatest depth, according as the channel is convex or concave. (7) The height of a wave may be indefinitely increased by propagation into a channel which becomes narrower in the form of

a wedge, the increased height being nearly in the inverse ratio of the square root of the breadth. (8) If waves be propagated in a channel whose depth diminishes uniformly, the waves will break when their height above the surface of the level fluid becomes equal to the depth at the bottom below the surface.

In Russell's completed report, published in the report of the British Association for 1844, he states that he had in the interim extended his inquiries to what he calls the negative wave of translation, being a wave which is propagated not as a ridge, but as a cavity in the surface of the water. He gives the following summary of his conclusions on this subject:

"The characteristics of this species of wave of the first order are—(1) that it is negative or wholly below the level of repose. (2) That it is a wave of translation, the direction of which is opposite to the direction of transmission. In other words, the movement of the fluid particles is in one direction, that of the wave in another. (3) That its anterior form is that of the positive wave reversed. (4) That the path of translation is nearly that of the positive wave reversed. (5) That its velocity is, in considerable depths, sensibly less than that due by gravity to half the depth reckoned from the lowest point, or the velocity of a positive wave having the same total height. (6) That it is not solitary, but always carries a train of secondary waves.

"It is important to notice that the positive and negative waves do not stand to each other in the relation of companion phenomena. They can not be considered in any case as the positive and negative portions of the same phenomena, for the following reasons: (1) If an attempt be made to generate or propagate them in such a manner that the one shall be companion to the other, they will not continue together, but immediately and spontaneously separate. (2) If a positive wave be generated in a given channel and a negative wave behind it, the positive wave, moving with the greater velocity, rapidly separates itself from the other, leaving it far behind. (3) If a positive wave be generated and transmitted behind a negative wave it will overtake and pass it. (4) Waves of the secondary class, which consist of companion halves, one part positive and the other negative, have this peculiarity, that the positive and negative parts may be transmitted across and over each other without preventing in any way their permanence or their continued propagation. It is not so with the positive and negative waves of the first order. (5) If a positive and negative wave of equal volume meet in opposite directions they neutralize each other, and both cease to exist. (6) If a positive wave overtake a negative wave of equal volume they also neutralize each other and cease to exist. (7) If either be larger, the remainder is propagated as a wave of the larger class. (8) Thus it is nowhere to be observed that the positive and negative wave coexist as companion phenomena.

"These observations are of importance for this reason, that it has been supposed by a distinguished philosopher that the positive and negative waves might be corresponding halves of some given or supposed wave."

J. Scott Russell's researches were undertaken mainly with reference to navigation on canals. He concludes that the most economical velocity for a boat on a canal is that of the wave of translation which it causes—that is to say, the velocity due to one-half the depth. A boat moving with this velocity remains constantly on the crest of the wave, whereas a boat moving with a greater or less velocity is constantly generating new waves, which precede or follow it, and these waves are created at the expense of the motive power. Unfortunately this conclusion is of little practical value, as, in an ordinary canal of 5 feet depth, it would require a velocity of something over 9 miles an hour, which can not be attained with horses.

The great primary wave of translation occurs in canals, rivers, and estuaries. It does not occur on the open sea except in the form of a tide. This is a wave corresponding in all respects to the great primary wave of translation. It moves with a velocity very near that due to one-half the depth of water, and it affects the water through its entire depth. The fact noted by Russell that the height of a wave may be indefinitely increased by propagation into a narrowing channel, accounts for the enormously high tides observed on some coasts. For instance, in the Bay of Fundy the tide rises to a height of 60 feet, while it is not over 12 feet on the coasts of New England. Also in the Bristol Channel there is a tide of about 18 feet at the entrance, while at Chepstow it attains the height of 50 or 60 feet. These phenomena result from the concentration of the energy of a moving wave of water into a narrowing space.

A series of experiments upon waves was made in 1859 by Bazin, an officer of the French Corps of Engineers. He had a perfectly straight and regular channel about 6½ feet wide, the bottom of which was inclined at the rate of about 1½ feet in 1,000, which gave him an opportunity of observing the effect of the diminishing depth upon the velocity and form of the wave. For the case of isolated waves, stations were established at distances of 60 to 65 feet, at which the time of the passage of the wave was noted. A few results of these observations are given below. They refer to positive waves—that is, to those which are wholly above the general water-level. These were generated by the sudden admission of a certain volume of water into the canal.

No. of points of observation.	Depth of water before the passage of the wave, feet.	Height of the wave, feet.	VELOCITY OF THE WAVE, FEET PER SECOND.		Remarks.
			Observed.	Calculated.	
1	2·24	0·39	....	....	
2	2·16	0·30	8·70	9·04	
3	2·04	0·30	8·88	8·77	
4	1·95	0·30	8·26	8·58	
5	1·85	0·33	8·67	8·44	
6	1·75	0·36	8·68	8·30	
7	1·64	0·36	8·32	8·13	
8	1·55	0·36	8·12	7·93	
9	1·46	0·39	7·80	7·78	The wave did not break until a little past the 13th point of observation.
10	1·35	0·39	7·85	7·60	
11	1·45	0·39	7·54	7·59	
12	1·12	0·43	7·46	7·38	
13	0·80	0·52	6·69	6·80	
1	2·08	0·39	....	...	
2	2·00	0·46	8·81	8·90	
3	1·88	0·52	8·64	8·84	
4	1·79	0·62	9·43	8·80	
5	1·69	0·62	8·04	8·73	
6	1·59	0·62	7·62	8·53	
7	1·48	0·62	9·00	8·33	
8	1·39	0·62	7·65	8·13	
9	1·30	0·62	7·99	7·95	
10	1·19	0·62	7·57	7·74	The wave broke between the 12th and 13th points of observation.
11	1·29	0·56	7·46	7·66	
12	0·96	0·62	7·46	7·41	
13	0·64	0·36	7·13	6·51	

The wave traveled about 100 feet before passing the first point of observation. Here it moved as a perfectly symmetrical undulation, unaccompanied by any other wave. As the depth diminished the height of the wave increased and its velocity diminished as indicated by the figures; the front of the wave became steeper, till finally it broke into a mass of foam, and, resolving itself into a number of smaller waves, pursued its course. It generally broke before the depth became equal to the height of the wave, not fully verifying Russell's law in that respect. The velocity of the wave is computed according to the law announced by Russell, and agrees very well with observation. If too much water was admitted the entire mass did not continue together as a single wave. The superfluous water was thrown off, and formed one or more separate waves. Experiments were made upon negative waves, generated by suddenly withdrawing a quantity of water from the channel. This differed from the positive wave in this respect—it could not be generated singly. It was always accompanied by a series of oscillatory waves. Its velocity, however, contrary to the view expressed by Russell, was very nearly the same as that acquired by a heavy body in falling freely a height equal to one-half the depth of water reckoned from the lowest point of the wave. Bazin found that these waves were propagated according to the same law in moving as in still water, due allowance being made for the velocity of the current. The negative wave diminishes and decays much more rapidly in still water than the positive wave; which latter has, according to Russell, a remarkable longevity. This observer found that a wave of this description 6 inches in height was diminished only 1 inch by traveling 700 feet. Another, starting with a height of 6 inches, was 2 inches high after a journey of 3,200 feet. Both the negative and positive waves diminish much more rapidly in moving than in still water.

The *breaking* of a wave occurs when the conditions under which it finds itself do not admit of the necessary movements of the fluid particles. The movement of a wave in water of diminishing depth is the most common case. Another is the case above noticed of the solitary wave, which, when formed of a magnitude greater than corresponds to

the depth of the channel, spontaneously separates itself into two or more smaller waves. When a wave originating in deep water rolls toward a shoaling beach the water constituting the top of the wave is moving, at any given instant, toward the shore—that at the bottom in the opposite direction. This results from the circular movement of the fluid particles. This movement ceases at the instant of breaking, and the upper part of the wave moves forward toward the shore, while the lower part moves backward. This movement extends nearly to the shore, the great volume of water set in motion by the breaking waves moving toward the shore upon the surface and returning at the bottom. This action constitutes the under-tow which often proves dangerous to surf-bathers.

Waves always approach the shore in a direction nearly at right angles to the general line of the shore, whatever be the direction of the wind. This arises from the fact that if the wave approach in a direction inclined to the shore, the end nearest to the shore moving in shallow water is retarded, tending to swing the wave round into a direction at right angles to the shore. At a distance of 2 or 3 miles from the shore the waves usually move in the direction of the wind.

When the shore rises perpendicularly out of deep water, the waves do not break. They simply oscillate, rising a little higher at the shore than elsewhere, and are reflected, forming a new system of waves running in the opposite direction. It is said that vessels can lie off such a shore in the heaviest storms without danger. This fact is sometimes turned to account in the construction of breakwaters, which have latterly been made as perpendicular walls. In water so deep that the waves do not break, this form is well calculated to withstand their action. In shallow water, or where, as sometimes happens, the action of the waves and shore-currents is such as to deposit a bank of gravel or sand at the foot of the breakwater, causing the waves to break, their action is very destructive.

Earthquakes are sometimes accompanied by waves of formidable proportions, inundating shores ordinarily high above the reach of the tide. During the earthquake which destroyed the city of Lisbon in 1755 a wave 40 feet high rolled upon the shore. An Englishman residing there recorded in his journal that shortly after this wave ships at anchor in the deep river Tagus were observed resting on the ground. The wave was followed by two others of nearly the same height. A wave 60 feet in height reached Cadiz on the same occasion. The sea rose 20 feet in the Antilles, where the tide rarely exceeds 2 feet. Similar phenomena have been observed to accompany South American earthquakes. Humboldt relates that at Callao he saw a series of waves 10 or 14 feet high in the midst of a dead calm, which he supposed to originate in submarine earthquakes.

The force of waves as they break upon a shelving beach, and the circular movement of the water is transformed into a forward movement, is terrific. Constructions designed to withstand the force of waves tax to the utmost the resources of engineering. Thomas Stevenson relates that during the construction of the lighthouse at Barra Head, one of the Hebrides islands, he saw the waves move a stone measuring 500 cubic feet. The breakwater at the French port of Cherbourg is composed of an immense bank of loose stone, protected in parts by blocks of concrete measuring 700 cubic feet each. The bank is surmounted by a wall about 20 feet high. During the storm of Dec. 25, 1836, stones weighing nearly 7,000 lb. were thrown over the top of this wall, while many of the enormous concrete blocks were moved, some of them as much as 60 feet, and two of them were turned over. Hagen relates that in the harbor of Cette, during the storm of Aug. 20, 1857, a block of concrete measuring 2,500 cubic feet, which must have weighed 125 tons, was moved upon its bed something over 3 feet. Thomas Stevenson constructed an instrument for the direct measurement of the force of waves. He found that during the heaviest storms the force exerted by the waves of the Atlantic upon a solid surface exposed to their action is upon an average 611 lb. per square foot during the summer months, and 2,086 lb. during the winter months. The greatest pressure observed was 6,083 lb. per square foot.

A remarkable phase of wave-movement, alluded to by J. Scott Russell as the "tidal bore," is occasionally presented upon tidal rivers. The advent of the flood-tide is preceded and announced by a wave, sometimes of formidable dimensions, which runs up the river, announcing its advance by a great noise, and sweeping away all floating bodies which it encounters on its passage. It occurs in India on the Hugli, in South America on the Amazon, upon the Seine and the Dordogne in France, where it is known as the *mascaret*, and in many other places. It is also recognizable by close inspection upon several smaller rivers. It occurs in considerable force on the Severn in England. It has been observed with great interest upon the Seine by the French engineer officers. It occurs only at the period of high or spring tides. The first wave has a height of 7 or 8 feet. It is followed in rapid succession by four or five smaller waves, and after their passage the water is found to have risen 4 or 5 feet above low tide. Those who have studied the subject give the following explanation of this remarkable phenomenon: At the period of dead low water the river is very low, and is flowing rapidly toward the sea. To better understand what occurs, we may conceive the rise of the tide to take place by a series of sudden jumps at regular intervals. That is, instead of supposing the tide to rise uniformly at the rate of say 1 foot in 12 minutes, let us consider what would take place if it were to rise suddenly 1 inch each minute. The first rise would move up the stream as a kind of wave, leaving a little deeper water behind than before it. The second would move a little faster than the first, both on account of the increased depth, and also by reason of the slightly diminished current. It accordingly very soon joins the first, and both advance as a single wave. Every successive wave, for the same reason, moves a little faster than the preceding, and all join the initial wave. Now, though the rise of the tide does not take place by perceptible sudden jumps, as supposed, it nevertheless does consist of a great number of very small increments of depth, and the influence of each successive increment of depth moves up the river faster than that of the preceding, so that all are concentrated into one grand wave. Where there is sufficient depth for the development of wave-motion, the bore does not break. In shoal water it breaks continually, and it does not, like other waves, exhaust itself by breaking, as its power is continually renewed. It has not been shown that the breaking wave follows the law of the great primary wave in moving with the velocity due to one-half the depth reckoned from the top of the wave. An ordinary flood moving down the channel of a river is an example of the great primary wave. Where the flood results from the sudden accession of a great volume of water to a shallow channel it moves with all the characters of the tidal bore. Such a flood may result from the bursting of a reservoir or from the storms which occur in mountainous regions of warm countries.

Thus far the undulatory wave has been considered, whose velocity depends on the wave-length, and the great primary wave whose velocity depends on the depth of water. There is a third class of waves distinguished from both the preceding. This distinction results from the peculiar character of the surface of water. An exceedingly thin film at the surface appears to lose in some degree the character of a fluid, and to acquire a certain stiffness and coherence not possessed by the general mass. (See LIQUIDS.) Its action is seen in the bubbles which float on the surface of water where there is a slight fall. The falling water carries down masses of air into the standing water. These masses, on rising, do not escape into the atmosphere directly, but lift the coherent film of the surface and remain momentarily inclosed in little hemispherical cells.

The tenacity of this film is so slight as to exert no appreciable influence upon ordinary undulatory waves; but the slight disturbances called ripples caused by a light puff of wind or by a stone dropped into still water are so strongly influenced by surface tension that they must be regarded as a distinct order of waves. The tension of the surface acts downward at the crest of the wave and upward at the trough. It increases the force with which the displaced particles tend to regain their positions. Its effect is to cause the wave to move faster than it would move under the action of gravity alone, just as an increase of the elastic force of a spring increases the rapidity of its vibrations.

The subject of waves in water can not be regarded as complete in its practical aspect without considering the pulsations which occur in closed pipes. An impulse communicated at any point to the water filling a closed pipe has the effect of putting the contiguous particles in a state of compression. This state of compression travels through the pipe with a velocity practically independent of the head or state of compression previously existing in the water. There is this analogy between the velocity of pulsations in pipes and waves in open channels: The latter move with the velocity

which a heavy body would acquire in falling a distance equal to half the depth of water in the canal. The former move with the velocity which a heavy body acquires by falling through a height equal to half that of a column of water representing its elastic force. The elastic force of any substance is the ratio which any force applied to it bears to the change of volume occasioned by the same. A pressure of one atmosphere, represented roughly by a column of water 34 feet high, diminishes the volume of water $\frac{1}{20000}$th part. The elastic force of water therefore is represented by a column of water 680,000 feet high. A heavy body falling one-half this distance would acquire a velocity of 4,677 feet per second. Experiment shows the velocity of pulsations or sound-waves in water a little greater than this, viz., 4,708 feet.

The force mains leading from the pumps in town waterworks systems are constantly traversed by pulsations resulting from the action of the pumps. Every stroke of the pump causes a momentary increase of pressure which travels through the force main and all connecting pipes with a velocity of 4,708 feet a second. Reaching the open end of the pipe the pressure is released, and a negative wave travels back toward the pump. A pressure-gauge communicating freely with such a pipe is in a constant state of violent movement.

The subject of waves or pulsations in pipes is intimately connected with the impulse which occurs when the movement of water in the pipes is suddenly checked. To understand the nature and intensity of the force so generated a pipe of indefinite length, in which the water moves with a velocity of say 3 feet a second, may be selected as an illustration, and suppose this movement to be instantaneously arrested by the closing of a gate or valve. A great pressure is immediately developed at the valve, and this pressure is transmitted backward through the pipe with a velocity of 4,708 feet a second. That is to say, the water at a distance of 4,708 feet from the valve would come to rest in one second after the closing of the valve, and during that time would move 3 feet. The pressure developed by the arrest of motion is sufficient to diminish the length of a column of water 4,708 feet long by 3 feet, which is ·000637 of its entire length. Now a pressure of one atmosphere diminishes the length of a column of water by $\frac{1}{20000}$th part, so that the above diminution of ·000637 corresponds to 12·75 atmospheres, or to a head of $12{\cdot}75 \times 34 = 435{\cdot}5$ feet. It results from this mode of treating the question that the pressure resulting from an instantaneous arrest of movement does not depend upon the length of the pipe.

For the convenience of those who would like to pursue the subject of waves further the following sources of information are indicated. The labors of Newton, Laplace, Bernoulli, and Lagrange need not be particularized. They are interesting only as a part of the history of the subject. To Franz Gerstner is due the credit of having first solved the problem of wave-movement upon the assumption of a finite displacement of the fluid particles. His essay is contained in the *Transactions* of the Royal Bohemian Scientific Society (*Abhandlungen der kgl. Böhm. Gesellschaft der Wissenschaften*) for 1802. It was also separately printed at Prague in 1804, and is likewise contained in Gilbert's *Annalen*, vol. xxxii., as well as in Webers' *Wellenlehre*. This latter was published by the brothers Ernst Heinrich Weber and Wilhelm Weber at Leipzig in 1825. It is entitled *Wellenlehre auf Experiment gegründet* (Theory of Waves founded upon Experiment). J. Scott Russell's researches, as already mentioned, are contained in the *Reports* of the British Association for 1837 and 1844. The most complete theoretical exposition of the subject is Prof. G. B. Airy's essay entitled *Tides and Waves*, contained in the *Encyclopædia Metropolitana*, vol. v. of Mixed Sciences. It is here treated in a thoroughly scientific manner and in the utmost generality, presupposing very high mathematical attainments on the part of the reader. Prof. Airy affirmed that his formulas agreed as well as could be expected with the results of Scott Russell's experiments, but this assertion was emphatically denied by the latter. Hagen's researches upon this subject are contained in the *Transactions* of the Royal Academy of Sciences of Berlin (*Abhandlungen der Königl. Akademie der Wissenschaften zu Berlin*) for 1861. They are also embodied in substance in his great work, *Handbuch der Wasserbaukunst* (Handbook of Hydraulic Architecture, Berlin, 1841–65), part 3, vol. i. He extends and verifies Franz Gerstner's theory of waves in deep water, and presents a theory of his own for waves in shoal water. His conclusions as to waves in shallow water are somewhat at variance with those of Russell and other experimenters. The memoir of Bazin is contained in the *Mémoires présentés par divers Savants à l'Institut Impérial de France* (Paris, 1865). The work is in two parts, the first relating to the flow of water in channels, the second to waves. Later writers on this subject include Earnshaw, Kelland, and Greene. Stokes's *Reports on Hydrodynamics* in the *Transactions* of the British Association are valuable, and rich in references. Prof. Greenhill has given the mathematics of the subject very fully in the *American Journal of Mathematics*. Prof. P. G. Tait's article in the *Encyclopædia Britannica* is valuable.

J. P. Frizell.

Wavre, *vaav'r*: town; province of Brabant, Belgium; on the Dyle; 15 miles S. E. of Brussels by rail (see map of Holland and Belgium, ref. 10–E). It has some breweries, tanneries, paper-mills, and cotton-spinning factories, but is best known in connection with the Waterloo (*q. v.*) campaign. The Prussians under Blücher having been defeated by Napoleon at the battle of Ligny took the route to Wavre, and arriving there on June 17, 1815, were able to come to the aid of Wellington at Waterloo on the following day. Pop. (1891) 7,575.

Wax [O. Eng. *weahs*: O. H. Germ. *wahs* (> Mod. Germ. *wachs*): Icel. *vax*; cf. Lith. *vaszkas*: Russ. *voskŭ*, which are possibly loan-words]: a generic term given to several substances chemically unlike, but resembling each other in the physical properties familiar in the wax of bees—for example, animal wax and vegetable wax. The vegetable world furnishes numberless wax-like bodies, only a few of which have been carefully examined, almost every plant, in fact, secreting a wax-like substance, especially in the seeds or in the fruit. The animal kingdom furnishes (1) the typical beeswax; (2) a kind of insect wax from the Orinoco and Amazon valleys, known as Andaquies wax; (3) Chinese wax, formerly supposed to be of vegetable origin; and (4) Spermaceti (*q. v.*).

Beeswax.—This is the wax of which bees form their cells. (See Bee.) Common beeswax is yellow, has an agreeable and peculiar smell, feels a little greasy, but more sticky, and moulds readily under the warmth of the fingers. Light bleaches it if exposed in thin sheets. It then becomes white wax, and is somewhat less fusible than before. A mixture of potassium bichromate and sulphuric acid also bleaches wax. Nitric acid and chlorine also bleach it, but the substitution product formed by the action of chlorine gives off irritating vapors of hydrochloric acid in burning the candles formed of such wax. If wax is agitated with dilute sulphuric acid—2 parts of water to 1 of acid—in presence of some fragments of nitrate of sodium, enough nitric acid is set free to destroy the feeble yellow color of the wax, and thus bleach it without injury. It is worth remembering, in this connection, that Gay-Lussac in his attempts to bleach wax by chlorine discovered one of the important laws of modern chemistry—that of *substitution*—by virtue of which chlorine, etc., may replace hydrogen in the constitution of organic bodies without a change of the typical form. Beeswax is freed from honey and adhering impurities by melting and stirring with water, which dissolves the traces of honey; the heavy solids fall to the bottom, and the wax forms a cake on the top of the water.

Bleached wax fuses at about 145° F. It is insoluble in water, but dissolves readily in oils, fats, and essences. By Lewy's analysis it contains carbon 80·2 per cent., oxygen 6·4 per cent., and hydrogen 13·4 per cent. It consists essentially of three substances, separable from each other by alcohol—(1) *myricine*, insoluble in boiling alcohol, and consisting chiefly of myricyl palmitate, $C_{16}H_{31}(C_{30}H_{61})O_2$; (2) *cerotic acid*, $C_{27}H_{54}O_2$; (3) *ceroline*, which remains in solution in cold alcohol.

The uses for wax are numerous and important. Its property of preserving tissues and preventing mould or mildew were well known to the ancients, who used cere-cloth for embalming, and wax for encaustic painting, as in the wall-pictures of Pompeii. Wax candles and tapers play an important part in the processions and ceremonies of the Roman Catholic Church. Wax is used by the manufacturers of glazed ornamental and wall papers and on paper collars and cuffs for polishing the surfaces. It is used in varnishes and paints, and for the "stuffing" of wood which is to be polished, as for pianos, coachwork, fine furniture, and parquette floors. Electrotypers use wax in forming their moulds. Wax is an important ingredient in preparations for covering sur-

faces of polished iron and steel to prevent rust. Combined with tallow, it forms the coating of canvas and cordage to prevent mildew, as in sails, awnings, etc. Artificial flowers consume much wax, and its use appears to be extending.

Wax Candles.—To form these candles, wicks of twisted (not plaited) Turkey cotton are suspended from a ring or hook over a caldron of melted wax, and a workman pours over them a stream of wax from a ladle, revolving each in succession to equalize the flow of the wax over the surface, until about one-third the intended size is obtained, when, after cooling, the same operation is repeated until the candles are about half size. While still warm they are then removed from the hooks, and rolled between two marble slabs to give them a cylindrical form and straightness. The upper end of the candle is now formed by cutting down the wax to a metal tag which covered one end of the wick. The candles are then suspended again on the hook, changing ends, and the operation of basting and rolling repeated until the desired size is attained. The lower ends are then cut off to an even length. Large wax candles, used at church altars, are formed up from thin slabs of wax by rolling them over the wick and finishing as before. Wax tapers are made by a sort of wire-drawing process, the wicks, wound on a drum, being drawn through the molten wax at a regulated temperature, passing through graduated holes to size the tapers, and thence to a cooling drum.

Andaquies wax (*cera de los Andaquies*) is a peculiar wax produced by a little bee called *caveja* by the Tamas Indians, of the Rio Caqueta on the plains of the Amazon, above the Magdalena river. These insects build on the same tree numerous combs, each of which yields from 100 to 250 grammes of yellow wax, about 3 to 8 oz. troy, which, purified by boiling water, has a slightly yellowish color and melts at about 170° F.

Carnahuba wax is the product of a palm (*Copernicia cerifera*) growing in Northern Brazil, and especially in the province of Ceara, forming a thin layer on the surface of the leaves. It scales off easily from the cut leaves when dried in the shade, and is readily fused and moulded into candles. It is soluble in boiling alcohol and in ether, and on cooling shows a crystalline structure. It melts at 185° F., and is very brittle and readily powdered. (See VEGETABLE WAX.) *Chinese* or *Insect wax* is a dazzling white wax called by the Chinese PEH-LA (*q. v.*) or "White wax." For a full account of its preparation see Hosie's *Three Years in Western China* (London and New York, 1890), pp. 189–201.

Fossil Wax (*Ceresin*).—Under the so-called fossil wax are several distinct mineral hydrocarbons of the general formula C_nH_{2n}, belonging to the ethylene series—one especially of which (ozokerite) is of considerable economic importance as a substitute for beeswax, which in many physical properties it much resembles. The fossil paraffins are: (1) *Urpethite*, from Urpeth colliery (*Johnston*), melting at 102° F., sp. gr. ·885, and soluble in cold ether; it adheres to the fingers and stains paper. (2) *Hatchettite*, from Scotland (*Johnston*), a soft wax, sp. gr. ·916–·983, pearly, glistening, yellowish in color, greasy to the feel; melts at 115° F., dissolves very sparingly in cold ether and boiling alcohol, crystallizing as it cools from the hot ethereal solution. (3) *Ozokerite*; the original mineral was from Slanik in Moldavia, and was wholly soluble in ether; that from Boryslav, in Galicia, is insoluble in cold ether, but largely so in hot ether. Its sp. gr. is ·944, and melting-point 140° F. (4) *Zietrisikite*, like the last-named in nearly all physical characters; as hard as beeswax or harder; melts at 194° F., has a density of ·9–·946, and is distinctly separated from ozokerite by its almost complete insolubility in ether. It occurs at Zietrisika, in Moldavia, in large masses.

It is asserted by some chemists that this series of fossil wax does not afford paraffin, as found in nature, but that this body is a product of transformation of the native hydrocarbons in the process of manufacture, just as petroleum is changed in part to paraffin during the process of distillation of the crude oil.

Ceresin is a trade-term applied to the purified ozokerite from Drohobicz and Boryslav, in Galicia, and from Gresten, in Austria. The crude product, freed by fusion from sand, clay, and other impurities, is of a deep-brown color, with a greenish tint, has a sp. gr. of ·940 to ·990, exhales a naphtha-like odor, and in hardness, fracture, and plasticity greatly resembles beeswax. It is very combustible, burning with a pure rich flame of high illuminating power. It dissolves with difficulty in oil of turpentine. It is purified and bleached by means of Nordhausen sulphuric acid, which attacks only the foreign bodies in the ozokerite, leaving the colorless hydrocarbon untouched. It is used for all purposes for which beeswax is employed, and by its higher melting-point is capable of uses to which the former is not adapted. It is said not only to retard, but entirely to prevent, rancidity in ointments—a most valuable quality. Large deposits of ozokerite have been found in Utah, and the product from this source is about 350,000 lb. annually. Revised by IRA REMSEN.

Waxahach'ie: town (founded in 1847); capital of Ellis co., Tex.; on the Hous. and Tex. Cent. and the Mo., Kan. and Tex. railways; 30 miles N. of Dallas, 180 miles N. E. of Austin (for location, see map of Texas, ref. 3–I). It is in an agricultural and stock-raising region, and has a new county court-house (cost $150,000), 6 churches, a public and 4 private schools, 3 national banks with combined capital of $300,000, a private bank, 2 street-railway systems, electric-light plant, a daily and 4 weekly newspapers, 2 cotton-compresses, 2 flour-mills, and a $50,000 cottonseed-oil mill. Its cotton receipts aggregate 60,000 bales annually. Pop. (1880) 1,354; (1890) 3,076; (1900) 4,215.

EDITOR OF "WEEKLY ENTERPRISE."

Wax-myrtle: See BAYBERRY.

Wax-palm: a name given to various wax-producing palms, especially to *Copernicia cerifera* (see CARNAHUBA PALM, PALM FAMILY, and WAX) and *Ceroxylon andicolum* of the Andes.

Wax-plant: the *Hoya carnosa*, a climbing greenhouse-shrub of the *Asclepiadaceæ* or milkweed family, a native of the East Indies, deriving its name from the wax-like appearance of its clustering white flowers.

Waxwing: a name applied to the birds of the passerine genus *Ampelis* because the inner wing-feathers and occasionally the tail-feathers are tipped with little appendages like flattened drops of red sealing-wax. These are borne by both sexes, and while they are usually best developed in old birds are found in the young as well. The waxwings are 7 or 8 inches in length, the plumage is thick, soft, and of a peculiar brownish ash above, ranging from ashy to almost cinnamon brown. There is a long pointed crest. There are three species, the well-known cedar bird, *Ampelis cedrorum* of North America, the Asiatic, *A. phœnicopterus*, found in Northeastern Asia and Japan, and the Bohemian waxwing, *A. garrulus*, which occurs in the northern part of Europe, Asia, and North America. They prefer fruit and berries, but also eat worms and insects. See CHATTERER.

F. A. LUCAS.

Waxwork: a plant. See BITTER-SWEET.

Waxy Degeneration: a diseased condition of certain tissues of the living body, in which parts of organs are changed into the substance known as amyloid. Though an albuminoid, it has reactions somewhat like those of starch. It takes a deep-brown red from iodine, and on the further addition of sulphuric acid becomes blue. Organs seriously affected by waxy degeneration, when cut, have a half-transparent look. The spleen, liver, and kidneys are frequent seats of the disease, and it is prone to occur in syphilitic and tuberculous persons and in those in whom there has been long-standing suppuration.

Way [O. Eng. *weg*: Germ. *weg*: Goth. *wigs*; cf. Lat. *via*, way, O. Eng. *wegen*, move, Lat. *ve'here*, carry, Sanskr. *vah*, carry]: in law, a right which a person or a community may have of passing at will, but in a given course, over the land of another. As thus employed the term is to be carefully distinguished from the sense attaching to it when used in, or as an equivalent for, the term highway. The latter always signifies a road—that is, a defined strip of land dedicated to the use of the public at large and under the control of the public authorities, while a way is the *right* which one person may have to use the land of another person in a particular manner, without reference to the course or path which may be taken or employed in the exercise of that right. Nevertheless, the right which each member of the community has to use the highway for legitimate purposes is not the less a right of way because it may be exercised in common by the whole body of the public.

Ways may arise in a variety of modes and may attach to persons in several different relations. The most convenient classification of these rights, however, is that which is based on the circumstances and conditions under which they arise. As thus contemplated, four different forms or varieties of ways may be distinguished: 1. *Ways that are easements.* An easement may be defined as a privilege, without profit,

which the owner of one tenement has a right to enjoy *in respect of that tenement* in or over the tenement of another person, by reason whereof the latter is obliged to suffer some use of his tenement which would otherwise be unlawful, or to refrain from some use of it which would otherwise be lawful. That way, then, is a true easement, which is claimed in respect of the tenement, or premises, of the person enjoying it, and which is therefore an appurtenance of such premises, passing with them and having no independent existence apart from them. Such a way is popularly described as belonging to the land in respect of which it is exercised, rather than to the owner for the time being of such land, and this popular description is fairly expressive of the real nature of the right. (See EASEMENT.) 2. *Ways in gross.* Rights sometimes called "easements in gross" are such as appertain to an individual, entirely without reference to any property belonging to him. Such rights not being enjoyed in respect of any tenement are not properly classified as easements, though, in the mode of their exercise and in the nature of the privilege enjoyed, there is no distinction between them and easements proper. There is this radical difference, however—a right in gross, being a merely personal privilege, can not be transferred by the person who may for the time being be in the enjoyment of it, and it will of necessity die with him, whereas an easement has all of the vitality and perpetuity of the tenement, or estate, to which it pertains. (See SERVITUDES.) 3. *Customary ways.* Though this phrase points to the mode in which these rights originate, rather than to the circumstances under which they may exist, the term comprehends a large and important class of privileges akin to easements, and yet differing from them in important particulars. The English law presents many cases of community rights over the land of individuals. Thus the inhabitants of a certain village or the members of a certain trade may have the right to use the land of some individual for purposes of recreation, or of erecting booths and holding a fair, or of crossing it to go to church or to market. The right is regarded as the result of an immemorial custom, too ancient and too long acquiesced in to be disputed, and it covers the case of every person who belongs to the community or group enjoying the right, no matter how short or long his membership may be. Such rights are very common in England, but they can hardly be said to exist in the U. S., New Hampshire being the only State in which they have been recognized. In several of the States it has been expressly decided that rights claimed by custom can not exist in the U. S., as there can be no customs of immemorial antiquity in a new country. 4. *Public rights of way.* A few simple and indispensable privileges with respect to the property of private individuals are recognized by the common law as vested in the whole body of citizens of the State, or in the public at large. The most familiar examples of these common rights are the rights of way in highways, in certain private streams (see *Law of Rivers*, under RIVERS), and upon the seashore (see RIPARIAN RIGHTS). These may also arise, like the customary rights above described, from immemorial user, but they are to be distinguished from the latter by their "common"—i.e. universal—character. A custom which extends throughout the kingdom, or state, ceases to be a custom: it is a part of the "common" law, and has no need to justify itself. Ways of this description exist equally in the U. S. and in England.

In respect of the nature and extent of the use permitted, the Roman law distinguished three grades of the right under consideration: *iter*, for foot passengers only; *actus*, for passage either on foot or with horses, vehicles, or cattle; and *via*, which, in addition to the uses above specified, included also that of drawing heavy burdens. The term *via*, like our term highway, carried with it also the implication of a defined path or roadway, though, unlike highway, it comprehended private as well as public ways. Although there is in our law no classification of ways in accordance with these distinctions, the right may exist in these several degrees.

The principal modes in which ways may be acquired are as follows: 1. *By grant.* This is the usual and characteristic way by which all easements come into existence. It is in effect an express gift or conveyance by an owner of land, by deed, of a right to use his land for the purpose of passing and repassing in a certain course. A person who, upon alienating a portion of his land, expressly retains or reserves out of the estate conveyed a right of way over it for the more convenient enjoyment of the unsold portion, also acquires his easement by grant. 2. *By implication.* Where a conveyance is silent on the subject, but the situation of the land and its past and present uses and modes of enjoyment seem to require such a construction of the deed, an easement may be implied in favor of the grantor or grantee, as the case may require. The best illustration of an easement by implication is afforded by the so-called way of necessity. A way of necessity arises when A, being owner of land, conveys a portion thereof to B, so surrounded by other tracts that B is entirely cut off from access to any highway. Under such circumstances B has "of necessity" a right of way appurtenant to his parcel over the remaining land of A to a convenient highway, although the deed makes no mention of such a right. The same result follows in favor of A if he retains the isolated tract, while selling all the lands by which it is surrounded. 3. *By prescription.* Long-continued user, dating back to time beyond legal memory, is the equivalent of a grant in establishing an easement of a way. The period during which such user must continue in order to ripen into a right has generally been fixed by statute or judicial decision at twenty years. See PRESCRIPTION.

The foregoing methods of creating rights of way are applicable only to such rights as are in the nature of easements, as above described, and easements of way can originate only in one or other of those methods. It remains to describe the several modes in which ways that are not easements may arise, viz.: 4. *By license.* This is the usual and sufficient manner of creating or conferring the privileges known as rights in gross. The permission may be oral or written, but it is in any event, excepting when coupled with a valid interest or property right, revocable at the pleasure of the owner of the land over which the right is exercised. 5. *By custom.* This method of establishing the class of privileges known as customary rights, or more commonly as rights by custom, has been explained above in describing the nature of those rights. A custom, in order to have the effect of justifying such an encroachment on private property rights, must not only be of great antiquity, but must also be reasonable and continuously observed. 6. *By dedication.* This term signifies the owner's act in giving the public at large rights of way over his land, and the consequent creation of a highway. It may be evidenced by any formal or informal act, signifying the owner's consent to such use, from the execution and recording of a deed to the silent acquiescence in the public use of his land for highway purposes. 7. *By common law.* The operation of a universal custom in imposing a public burden upon private property has been referred to above in connection with public rights of way.

Rights of way, whether in the nature of easements or of personal rights, have the common characteristic that they must be exercised in strict conformity with the nature and extent of the right existing in the case in question. A right to pass and repass on foot can not be availed of to justify a way for cattle or wagons; a right which is appurtenant to an adjoining tenement can not be enjoyed by a stranger, nor for any and all purposes even by the owner of such tenement. The use of the latter must always be in connection with or with respect to such tenement. Otherwise, his use of the way is a trespass. Moreover, there is in the U. S. no such thing as an *unlimited* right of way. A way always contemplates a definite course or route between certain fixed points, and no other course may be taken but the one so determined. The owner of the land over which the right of way exists may make any use of his property which is not inconsistent with the ordinary and reasonable exercise of the right by the person or persons enjoying it. He may, accordingly, erect a bridge or arch over the path, road, or area in which the way is exercised, provided he does not thereby materially impair its utility as a way of the kind in force. But he is under no obligation to provide or keep in repair any path or road for the exercise of the way. It is the duty of the person claiming the right to make his own road and keep it in repair. For that purpose he may enter upon the land at all reasonable times, and do whatever is reasonably necessary to keep his path or road in condition for use. If the road becomes "founderous" or impassable, without the fault of the owner of the premises, the person having the right of way may not diverge and take another path even temporarily. The right, having once been fixed at and by a certain line, can not be changed without the consent of the owner of the burdened land. It is otherwise, of course, where the road has been

rendered impassable or inconvenient by the act of the tenant of the freehold. In the case of highways, however, the interests of the public have dictated a different rule. There, if the road becomes impassable from any cause, a traveler may go over the adjoining land, even though in so doing it becomes necessary for him to do damage to fences or crops. But, as is elsewhere explained (see HIGHWAY), the rights of the owner of the soil over which a highway has been laid out are in all essential particulars identical with those which the owner of a servient tenement, subject to a private right of way, retains in the land affected by such right. His dominion over and his right to use and enjoy his land are affected only so far as such right of way necessarily interferes with the same. Any unauthorized use of the highway is as much a trespass upon his rights as if committed on any other portion of his lands.

There are several satisfactory modern treatises on the law of easements in which the law of ways is adequately considered. See especially works of Gale, Goddard, and Washburn on *Easements*; Leake on *Uses and Profits of Land* (part iii. of his *Digest of the Law of Land*); and Gray's *Cases on Property*, vol. ii. GEORGE W. KIRCHWEY.

Waycross: city; capital of Ware co., Ga.; on the Bruns. and West., the Sav., Fla. and West., and the Wayc. Air Line railways; 60 miles W. of Brunswick, 96 miles S. W. of Savannah (for location, see map of Georgia, ref. 7–I). It has a national bank with capital of $50,000, a State bank with capital of $50,000, and a daily, a monthly, and two weekly periodicals, and is principally engaged in the manufacture of lumber and naval stores. Pop. (1880) 628; (1890) 3,364; (1900) 5,919. EDITOR OF "HERALD."

Wayland: town (incorporated in 1835); Middlesex co., Mass.; on the Sudbury river, and the Boston and Maine Railroad; 15 miles W. of Boston (for location, see map of Massachusetts, ref. 2–H). It contains the villages of Wayland and Cochituate, has 4 churches, high school, 7 district schools, and a public library (founded in 1850 and said to have been the first free library in the U. S.), and is principally engaged in agriculture and the manufacture of shoes. In 1894 it had an assessed valuation of $1,500,000. Pop. (1880) 1,962; (1890) 2,060; (1900) 2,303.

Wayland, FRANCIS, D. D., LL. D.: educator; b. in New York, Mar. 11, 1796, of English parents; graduated at Union College 1813; studied medicine and began practice at Troy, but, having joined the Baptist church (1816), devoted himself to the ministry; studied theology one year at Andover; was tutor in Union College 1817–21; pastor of the First Baptist church at Boston, Mass., 1821–26; became president of Brown University Feb., 1827, having previously filled for some months the professorship of Mathematics and Natural History in Union College; retired from the presidency in 1855, and was for fifteen months (1857–58) acting pastor of the First Baptist church at Providence, and was highly distinguished as a pulpit orator. D. at Providence, R. I., Sept. 30, 1865. He was the author of several volumes of sermons and addresses; *Elements of Moral Science* (1835); *Elements of Political Economy* (1837); *Limitations of Human Reason* (1840); *Thoughts on the Collegiate System of the United States* (1842); *Elements of Intellectual Philosophy* (1854); *Life of Rev. Adoniram Judson, D. D.* (2 vols., 1853); and other works. His *Life* was written by his sons Francis and H. L. Wayland (2 vols., 1867), also by Prof. J. O. Murray, of Princeton (Boston, 1890).
Revised by J. M. BALDWIN.

Wayland, HEMAN LINCOLN, D. D.: educator and journalist; b. at Providence, R. I., Apr. 23, 1830; educated at Brown University, graduating 1849, and Newton Theological Institution; tutor in the University of Rochester 1852–54; pastor Main Street Baptist church, Worcester, 1854–61; chaplain Seventh Connecticut Regiment 1861–64; Professor of Rhetoric and Logic, Kalamazoo College, Mich., 1865–70; president of Franklin College, Indiana, 1870–72; editor *National Baptist*, Philadelphia, 1872–94; editor of *The Examiner* 1894; joint author with his brother Francis of *Life and Labors of Francis Wayland* (1867); author of *Faith and Works of Charles H. Spurgeon* (1892); and numerous public addresses and sermons. C. H. THURBER.

Wayland the Smith: a favorite Germanic hero both in modern folk-lore (his cave is pointed out in Berkshire) and in the ancient myths. As Wêland he appears, with brief allusion to his legend, which found its best development among Low German traditions, in the oldest English lyric, *The Lay of Déor*; and in King Alfred's time he was selected as representative figure of the national past. "Where," asks the translator of Boethius, paraphrasing a verse of his original—"where are the bones of cunning Wêland the Goldsmith, most famous of yore?" As Vǫlundr he is one of the best-known heroes of Eddic poetry. (See Vigfusson-Powell, *Corpus Poeticum Boreale*, i., 169.) His father was Wade, a giant, whose "boat" is mentioned by Chaucer (*Merchant's Tale*, 1424), and who seems to have been a popular person in his own right: "tale of Wade," says Chaucer (*Troilus*, iii., 614). Wayland himself is the deified smith of Germanic heathendom, founder of an art held in the highest possible repute. The best praise of a weapon was to call it "Wayland's work"—the phrase occurs in the *Beowulf* and elsewhere—while, for the finer art of ornaments, Wayland is the goldsmith without a peer. According to the legend he owned "seven hundred arm-rings." The story of Wayland, particularly in the laming and flying episodes, seems to have suffered contamination. Bugge goes so far as to declare (*Studier*, pp. 22, note, 131) the myth to be an outright copy "from Greek and Latin narratives," and the name to be a corruption of Vulcanus. Nevertheless, we may accept Wayland as a Germanic hero and demigod. His name probably means "the skillful or artful one." For his legend in detail, see P. E. Müller, *Sagabibliothek*, and W. Grimm, *Heldensage* (3d ed.).
FRANCIS B. GUMMERE.

Wayne: village (platted as Derby's Corners in 1834); Wayne co., Mich.; on a branch of the Rouge river, and on the Flint and Pere Marq. and the Mich. Cent. railways; 18 miles W. of Detroit, 26 miles N. of Monroe (for location, see map of Michigan, ref. 8–K). It has 5 churches, graded public school, a State bank with capital of $25,000, a private bank, 2 weekly newspapers, and manufactories of cigars, carriages, brick, and peppermint oil. The first house was erected in 1824, and the village was incorporated in 1869 and 1877. Pop. (1880) 919; (1890) 1,226; (1900) 1,361.
EDITOR OF "WAYNE COUNTY REVIEW."

Wayne: city (founded in 1880); capital of Wayne co., Neb.; on the Chi., St. P., Minn., and Omaha Railway; 45 miles S. W. of Sioux City, Ia. (for location, see map of Nebraska, ref. 9–G). It is in an agricultural, sugar-beet growing, and stock-raising region, contains the Nebraska Normal College, 2 public-school buildings, 2 national banks with combined capital of $125,000, and 2 State banks with capital of $125,000, and has 4 weekly newspapers. Pop. (1890) 1,178; (1900) 2,119. EDITOR OF "HERALD."

Wayne: town (founded by G. W. Childs and A. J. Drexel in 1887); Delaware co., Pa.; on the Penn. Railroad; 14 miles W. of Philadelphia (for location, see map of Pennsylvania, ref. 6–J). It has 6 churches, a public school, 4 private schools, 2 public halls, 2 large summer boarding-houses, sewerage, steam-heating, and electric-light plants, waterworks, a trust company, country and cricket clubs, and many handsome residences. It is a charming place of suburban residence. Pop. (1890) 997; not returned separately in 1900. EDITOR OF "TIMES."

Wayne, ANTHONY: soldier; b. at East Town, Chester co., Pa., Jan. 1, 1745; educated at the Philadelphia Academy; became a surveyor and an intimate friend of Franklin; was agent of a land company in Nova Scotia 1765–66; married and settled on a farm in Chester County 1767; was elected to various county offices; was a member of the Pennsylvania convention and of the Legislature of 1774; served on the committee of public safety 1775; soon afterward raised a company of volunteers and became colonel of a regiment of Pennsylvania troops 1776; was wounded at the battle of Three Rivers; was commissioned brigadier-general Feb. 21, 1777; joined Washington in New Jersey; commanded a division at the battle of Brandywine, Sept. 11, being stationed at Chadd's Ford to oppose the passage of the river by Knyphausen; fought all day and effected a successful retreat at sunset; took command of a flying detachment of 1,500 men for the purpose of harassing the British rear, but was surprised at Paoli (close to his own homestead) by superior numbers on the night of Sept. 20, and lost fifty-three men; was acquitted of blame by a court martial held at his own request; led the right wing at the battle of Germantown Oct. 4; made a raid within the British lines in the winter of 1777–78, capturing numerous horses and cattle and abundance of forage; contributed by his skillful manœuvers to the victory of Monmouth June 28, 1778; led the attack at the storming of

Stony Point on the night of July 15–16, 1779, considered the most brilliant feat of arms of the whole war; was wounded in the head; received from Congress a vote of thanks and a gold medal; acquired the name of "Mad Anthony Wayne," and became the favorite popular hero; exhibited much address in suppressing a mutiny of the Pennsylvania line at Morristown Jan., 1781; joined La Fayette in Virginia Jan. 7; made with a part of a brigade a daring attack upon the whole British army at Green Spring or Jamestown Ford July 6, and by a bayonet charge disconcerted a projected manœuver against La Fayette; was present at the surrender of Cornwallis, after which he was sent to join Gen. Nathanael Greene in the South; defeated the Creek Indians June 23–24, 1782; took possession of Charleston, S. C., after its evacuation Dec. 14; retired to his farm in Pennsylvania after the war; served in the Pennsylvania Assembly 1784–85, and in the convention that ratified the U. S. Constitution; became general-in-chief of the U. S. army with the rank of major-general Apr. 3, 1792, and took command of an expedition against the Western Indians, whom he defeated at Fallen Timbers, or Maumee Rapids, Aug. 20, 1794; concluded with them the treaty of Greenville 1795, and while on his return homeward died at Presque Isle (now Erie), Pa., Dec. 15, 1796. His remains were removed in 1809 to Radnor church, near Waynesburgh, Pa., where a monument was erected by the Pennsylvania Society of the Cincinnati July 4, 1809. His *Life*, by Gen. John Armstrong, is in Sparks's *American Biography*, and his *Regimental Orderly Book* was printed at Albany in 1859.
Revised by F. M. Colby.

Wayne, James Moore, LL. D.: jurist; b. at Savannah, Ga., in 1790; graduated at Princeton 1808; became a lawyer and politician at Savannah; sat in the Legislature; presided over two constitutional conventions; was mayor of Savannah 1823, judge of the superior court of Georgia 1824–29, member of Congress 1829–35; was an efficient debater, an advocate of free trade, and an active supporter of the policy of President Jackson, by whom he was appointed an associate justice of the Supreme Court of the U. S. Jan. 9, 1835, and gave especial attention to admiralty jurisprudence. D. at Washington, D. C., July 5, 1867.

Waynesboro: city (laid out as a town in 1783, incorporated as a city in 1888); capital of Burke co., Ga.; on the Cent. Railroad of Ga.; 32 miles S. of Augusta, 100 miles N. W. of Savannah (for location, see map of Georgia, ref. 4–J). It has 7 churches—3 Baptist, 2 Methodist Episcopal, a Presbyterian, and a Protestant Episcopal—2 academies, 4 lower-grade schools, a State bank with capital of $50,000, and a weekly newspaper; contains manufactories of cotton-seed oil, guano, agricultural implements, and wagons; and was the scene of a battle in the war of the Revolution and of one in the civil war. Pop. (1880) 1,008; (1890) 1,711; (1900) 2,030.
Editor of "True Citizen."

Waynesboro: borough; Franklin co., Pa.; on the Mont Alto and the West. Md. railways; 14 miles S. E. of Chambersburg, 50 miles S. W. of Harrisburg (for location, see map of Pennsylvania, ref. 6–E). It is near South Mountain and Antietam creek, and in the civil war the majority of the Confederate army passed through it on the way to Gettysburg and on the following retreat. It has 8 churches, 2 public graded schools, Academy of Music, 2 national banks (combined capital, $125,000), several creameries, manufactories of ice-machines, engines, separators, steam-plows, grinders, tools, lathes, and agricultural implements, and 2 weekly newspapers. Pop. (1880) 1,888; (1890) 3,811; (1900) 5,396.
Editor of "Keystone Gazette."

Waynesburg: borough (laid out in 1796); capital of Greene co., Pa.; on Ten Mile creek, and the Waynes. and Wash. Railroad; 45 miles S. of Pittsburg (for location, see map of Pennsylvania, ref. 6–A). It is in an agricultural, stock-raising, oil, and natural-gas region, contains Waynesburg College (Cumberland Presbyterian), 2 national banks with combined capital of $225,000, several planing and flour mills, a carriage-factory, and a foundry, and has 4 weekly newspapers. Pop. (1880) 1,208; (1890) 2,101; (1900) 2,544.
Editor of "Independent."

Waynflete, or **Wainfleet**, wān'fleet, William of, otherwise called **William Patten**, or **Barbour**: bishop; b. at Waynflete, Lincolnshire, England, about 1405; educated at Winchester and at Oxford University; became head master of Wykeham's school at Winchester 1429; was appointed by King Henry VI. first master of his newly founded college at Eton 1442; became provost of Eton Dec., 1443; succeeded Cardinal Beaufort in the bishopric of Winchester 1447; founded Magdalen Hall, Oxford, 1448; converted it into a college with a liberal endowment 1456; also founded a free school in his native town; was lord high chancellor to Henry VI. during the disastrous years 1456–60, resigning three days before the battle of Northampton, and was generously treated by the victorious Yorkists. D. Aug. 11, 1486, and was buried in a magnificent chapel in Winchester Cathedral.
Revised by S. M. Jackson.

Wazan' (Rohlfs's *Wesan*): a holy city of Morocco; beautifully situated in a fertile region about 75 miles S. of the Straits of Gibraltar. It was founded toward the end of the ninth century by Muley Tayeb, a direct descendant of the Prophet. The sherif is superior in sanctity to the sultan himself. He is enormously rich, and the fact that he is a descendant of the Prophet makes him adored by all Mohammedans. The faithful throughout Morocco pay tribute to him, but a large part of the wealth coming to him is disbursed in charity and hospitality. Frequently hundreds, and sometimes thousands of pilgrims who come to kiss the hem of his robe of office are entertained at his expense. The sultan is not regarded as fully installed in his exalted place until he has been officially recognized by the saint of Wazan. Fugitives from justice are safe within the town, and not even the sultan's body-guard dare arrest a person who appears as a suppliant at the tomb of the founder of Wazan. In the mosque containing the tomb is a collection of about a thousand Arabic manuscripts. The religious authority of the present sherif (1895) has been greatly diminished by his pronounced friendship for Europeans, his marriage with an English Christian, and his almost continuous absence from Wazan, where he is represented in his sacred character by one of his sons, while he spends most of his time in Tangier. Pop. perhaps 3,000.
C. C. Adams.

Weakfish: the *Cynoscion regalis*, also called *squeteague*; very common along the eastern coast of the U. S. It belongs to the family *Sciænidæ*, and has as associates several other species, mostly peculiar to the southern coast of the U. S. —viz., *C. thalassinum*, *C. nothum*, and *C. maculatum*. These species are all distinguished by their elongated shape, the prominence of the lower jaw, and the armature of the upper one with canine teeth; the dorsal fin has nine or ten spines, and the anal fin one small spine. The weakfish is distinguished by its color, which above is pale brownish, with a decided greenish tinge, grading below into silvery; on the back and sides are irregular vermicular blotches disposed in an oblique direction, tending forward and downward; the ventral and anal fins are yellowish, the others neutral. It generally averages between 1 and 2 feet in length, and is found along the entire eastern coast S. of Cape Cod, but is most common in the warmer waters. It does not ascend into the fresh waters. It is a rather voracious fish, and readily seizes the hook, but its mouth is easily torn, and to this characteristic (weakness of mouth) the name refers.
Revised by F. A. Lucas.

Wealden (weeld'en) **Formation** [*wealden* is from the Weald, a district of Kent and Sussex, England; O. Eng. *weald*, forest, wood]: a series of fresh-water strata of the Cretaceous period, first studied in the Weald. The formation occurs also in Germany. Its animal fossils comprise the iguanodon, hylæosaurus, pterodactyl, and numerous species of turtles. Its vegetable fossils consist chiefly of ferns and the gymnospermatous orders of conifers and cycads. The fruits of several species of both orders have been found, and in some places the rolled trunks of different species of coniferous wood occur in enormous quantities.
Revised by G. K. Gilbert.

Wealth [M. Eng. *welthe*, deriv. of *wele*, weal < O. Eng. *wela*, *weola*, wealth, deriv. of *wel*, well > Eng. *well*]: a term that is used in two distinct senses: (1) the national sense, in which it includes all things which contribute to the happiness of mankind; (2) the individual sense, in which it is confined to those things which command a price. By business men the word is commonly used in the latter sense; by political economists it is chiefly used in the former sense, even when they define it in the latter one. To avoid this confusion it has been proposed to substitute the term *property* for the individual sense of the word wealth. A large part of the modern science of Political Economy (*q. v.*) deals with the relation between the individual acquisition of property and the growth of national wealth. The attempts to estimate the national wealth in dollars and cents,

as is often done, involves a confusion of the two senses of the word, and the result is misleading. A. T. HADLEY.

Weare, MESHECH: b. at Hampton, N. H., June 16, 1713; graduated at Harvard 1735: studied and practiced law; sat several years in the Legislature; was Speaker 1752; commissioner to the Colonial Congress at Albany 1754; became a justice of the Supreme Court and chief justice 1777; was councilor from Rockingham County and chairman of the committee of safety 1775; was chosen president of the State 1776, and annually re-elected during the war, in which he rendered great services to the defense of the Northern colonies from Burgoyne's invasion, raising and equipping the forces sent to the frontier under Gen. Stark; and was again chosen president under the new Constitution 1784. D. in Hampton Falls, N. H., Jan. 14, 1786.

Wearing: See TACKING AND WEARING.

Weasel [M. Eng. *wesele* < O. Eng. *wesle*: O. H. Germ. *wisala* > Germ. *wiesel*]: any one of various small animals, species of the family *Mustelidæ*, and especially of the genus *Putorius*. These are especially distinguished by the small number of molars, there being only thirty-four teeth in all, viz., M. $\frac{1}{2}$, P. M. $\frac{3}{3}$, C. $\frac{1}{1}$, I. $\frac{3}{3}$; the lower sectorial molar tooth has no inner tubercle; the body is very slender and elongated, especially in the small species, and so much so as to have obtained the name vermiform; the tail is moderate; the feet are essentially digitigrade. Weasels are among the boldest and most bloodthirsty of carnivorous animals, and especially destructive to poultry, which they generally seize by the neck, proceeding to devour the carcasses leisurely after sucking their blood, or perhaps, leaving satisfied with quenching their thirst for blood alone. The species are mostly confined to cold and temperate regions, although a few extend into tropical countries. The generally recognized species in North America are the *Putorius vulgaris*, or little weasel; the *P. longicauda*, nearly related to the former, found in the Upper Missouri and Platte countries; the *P. frenata*, or bridled weasel, of the southwestern U. S.; *P. cicognanei*; and the common *P. richardsoni*, which has come to be considered as distinct from the Old World ermine, *P. erminea*, with which it was long confounded. In Europe and Northern Asia are found a number of other species more or less closely related to those of North America. See also ERMINE. Revised by F. A. LUCAS.

Weather [(with change of *d* to *th* under Scandinavian influence) < O. Eng. *weder*: O. H. Germ. *wetar* (> Mod. Germ. *wetter*): Icel. *veðr*, wind, air, weather]: the current or passing state of the atmosphere, especially the conditions which affect man and his interests. It differs from climate, which represents the average of these conditions, or the average of all weathers. Climate changes slightly and slowly, but weather is constantly changing. The descriptive terms applied to weather—as cold, warm, dry, damp, wet, calm, windy, rainy, snowy—do not require special definition, and are used in a relative sense. For instance, what would be called cool weather in Cuba might be very warm weather at Mt. Desert in Maine; and what would be called dry at Greytown, Nicaragua, would be damp or wet at Santa Fé, New Mexico. By settled weather is meant a condition in which there is little intensity and little change in the meteorological elements from day to day. The opposite is variable weather. The weather of the Southern States and the Pacific coast is relatively settled; the most variable weather in the U. S. is along the northern boundary from the Rocky Mountains eastward. A spell of weather is the continuation of one type, especially in regions of variable weather, and a change of weather is the change from one type to another.

Weather is often named by a sort of metaphor referring to its effects. Thus fair weather is originally one suited to ordinary commercial operations, but it has been modified in its use by the U. S. Weather Bureau to indicate the absence of rain and of complete cloudiness. Foul weather is that unsuited for such operations, generally rainy and windy; dirty weather is that with low-flying clouds and slight driving rains; soft weather is that when the snow by melting, or the soil by rain, has softened and impedes travel. Again weather is bright, sharp, tonic, sweltering (or sultry) according to its physiologic, and dull, close, gloomy, according to its psychic effects. The weather preceding an approaching storm is especially noted for its effects in producing neuralgic and rheumatic pains, and this is, in large part, due to the increasing humidity. Indeed, changing humidity, by changing the rate of evaporation of the surface of the skin, and consequently its temperature, profoundly affects the individual and contributes largely to his comfort or discomfort. It is this which makes the difference between the bright and cheerful hot weather of arid regions (with temperature perhaps at 110° F.) and the muggy insufferable weather—close, moist, and sweltering though the thermometer may be at only 95° F.—which precedes summer thunder-storms in the Eastern States. The temperature of evaporation is substantially the temperature that is felt, and it is this that makes the hot weather of New Mexico quite as endurable as that of Ohio. See Harrington's paper *Sensible Temperatures* (Trans. Am. Clim. Assoc., 1893–94, 368–374). See CLIMATE, METEOROLOGY, and WEATHER BUREAU. MARK W. HARRINGTON.

Weather Bureau: a branch of the U. S. Department of Agriculture, established July 1, 1891, to take charge of the meteorological work of the Government which had grown up since 1870 under the Signal Service of the Department of War. This bureau is intrusted with the forecast of the weather, storms, and floods, with the distribution of such warnings, and with the compilation and distribution of such climatic or meteorological data as are required by the public interest. The bureau has about 1,000 paid employees, the most of whom devote their entire time to its service. Its annual cost has been on the average $838,100, while the annual cost for the years 1882–91 of the Meteorological Service (under the army, but not including the cost of military signaling) was $924,700. The annual saving resulting from the work of the bureau can not be estimated with certainty, but is undoubtedly many times the cost. The percentage of correct forecasts varies, but the general average is four out of five. It is lowest in ordinary weather and highest in storms or severe weather of any sort. In hurricanes from the West Indies it sometimes reaches five out of five, or 100 per cent. Under the U. S. Weather Bureau is a federal system of State Services which perform efficient aid in collecting information of a detailed character. The most of the civilized states now have weather services, all a development since 1870, but the function of weather forecasts attracts most attention in the U. S., Great Britain, France, Prussia, Saxony, and Russia. A special service in Hongkong is devoted to the forecast of typhoons.

MARK W. HARRINGTON.

Weatherford: city; capital of Parker co., Tex.; on the Gulf, Colo. and S. Fé, the Tex. and Pac., and the Weather., Min. Wells and N. W. railways; 40 miles N. W. of Cleburne, about 66 miles W. of Dallas (for location, see map of Texas, ref. 2–H). It is in an agricultural and stock-raising region, contains Weatherford College (Methodist Episcopal South), the Texas Female Seminary (Cumberland Presbyterian), a public high school with library, and 3 national banks with capital of $500,000, and has 3 weekly newspapers. Pop. (1880) 2,046; (1890) 3,369; (1900) 4,786.

Weather-glass: an instrument for indicating the state of the atmosphere, as the BAROMETER and HYGROMETER (*qq. v.*).

Weatherly: borough (incorporated in 1863); Carbon co., Pa.; on the Lehigh Valley Railroad; 10 miles E. of Hazleton, 14 miles N. W. of Mauch Chunk (for location, see map of Pennsylvania, ref. 4–I). It is in a coal-mining region, and has 6 churches, 12 schools, a building and loan association, a weekly paper, a large silk-mill, railway-shops, bicycle-factory, and brick-works. Pop. (1880) 1,977; (1890) 2,961; (1900) 2,471. EDITOR OF "HERALD."

Weathersfield: town; Windsor co., Vt.; on the Connecticut river; 3 miles W. of Claremont, N. H., 63 miles S. of Montpelier (for location, see map of Vermont, ref. 8–C). It contains the villages of Weathersfield, Weathersfield Center, Weathersfield Bow, Amsden, Ascutneyville, Perkinsville, and Felchville, and has a Baptist, a Protestant Episcopal, 2 Congregational, and 2 Methodist Episcopal churches, 2 hotels, and manufactories of apple-jelly, lime, lumber, butter-tubs, cider, soapstone sinks, shingles, carriages, and chair stock. Pop. (1880) 1,354; (1890) 1,174; (1900) 1,089.

Weather-signals: a code of signals, consisting of flags, cylinders, and cones, or whistles, adopted by the various national meteorological services to convey their forecasts of temperature, weather, and storms to the general public. The U. S. code consists of a series of flags for weather and temperature, a series of whistles from stationary engines for the same, and a series of flags for wind. The first two are used inland, the last at the ports.

The flag signals for weather and temperature are seven in

number: (1) A square white flag for clear or fair weather; (2) a square blue flag for rain or snow; (3) a square flag with the upper half white and the lower half blue for local storms; (4) a black triangular flag for temperature, above the others when the temperature is to rise, below when it is to fall; (5) a white square flag with a black square in the center to forecast a cold wave; (6) a red square flag with a black square center to forecast a severe storm; (7) a red pennant as an information signal at ports is also used in Sacramento and San Joaquin valleys in California to indicate the approach of a "hot norther."

Interpretation of Displays.

No. 1, alone, indicates fair weather, stationary temperature.

No. 2, alone, indicates rain or snow, stationary temperature.

No. 3, alone, indicates local rain, stationary temperature.

No. 1, with No. 4 above it, indicates fair weather, warmer.

No. 1, with No. 4 below it, indicates fair weather, colder.

No. 2, with No. 4 above it, indicates warmer weather, rain or snow.

No. 2, with No. 4 below it, indicates colder weather, rain or snow.

No. 3, with No. 4 above it, indicates warmer weather with local rains.

No. 3, with No. 4 below it, indicates colder weather with local rains.

No. 1, with No. 5 above it, indicates fair weather, cold wave.

No. 2, with No. 5 above it, indicates wet weather, cold wave.

These signals can be distinguished only within a radius of 2 or 3 miles (at the farthest), are invisible directly to windward or leeward, or in a calm, soon become too discolored to distinguish, and wear out rapidly.

The whistle signals are in some respects better. They are blown at fixed hours, and to one listening for them can sometimes be made out at a distance of 10 miles. The first whistle to attract attention is a long blast of from fifteen to twenty seconds' duration. After this warning signal has been sounded, long blasts (of from four to six seconds' duration) refer to weather, and short blasts (of from one to three seconds' duration) refer to temperature, those for weather to be sounded first.

Blasts.	Indicate.
One long	Fair weather.
Two long	Rain or snow.
Three long	Local rain.
One short	Lower temperature.
Two short	Higher temperature.
Three short	Cold wave.

Interpretation of Combination Blasts.

One long, alone	Fair weather, stationary temperature.
Two long, alone	Rain or snow, stationary temperature.
One long and one short	Fair weather, lower temperature.
Two long and two short	Rain or snow, higher temperature.
One long and three short	Fair weather, cold wave.
Three long and two short	Local rains, higher temperature.

For the ports the storm-signal as above (square red with a black center) is combined with a pennant which indicates the direction of the wind. A red pennant above the storm-signal indicates N. E. winds; below, S. E. A white pennant above, N. W. winds; below, S. W. winds. Two storm-signals one above the other is the forecast for a hurricane, or for the very severe and dangerous gales which sometimes pass the Great Lakes and North Atlantic coast. At some ports lights are used at night, a red light for easterly winds, and a white above a red for westerly.

On European coasts the system of signals devised by Fitzroy is used with some modifications. It consists of a large cylinder and cone which can be suspended and which will appear the same from whatever point viewed. The cylinder indicates the storm and is below; the cone, the direction of the wind—pointing upward for a northerly direction (from N. W. through N. to S. E.); pointing downward, the opposite. The cylinder is now discontinued in Great Britain. At night lanterns are hung at each angle of the cone and (to represent the cylinder) at the four angles of a square. MARK W. HARRINGTON.

Weaver-bird: any member of the PLOCEIDÆ (*q. v.*), a family of finch-like birds peculiar to Africa and parts of Southern Asia. They are named from their remarkable woven nests, which are constructed so as to protect the eggs and young from snakes and monkeys. Some are huge, heavy, and massive, clustered together in large numbers, and bearing down the branches with their weight. Others are light, delicate, and airy, woven so thinly as to permit the breeze to pass through their net-like interior, and dangling daintily from the extremity of some slender twig. Others, again, are so firmly built of flattened reeds and grass-blades that they can be detached from their branches and subjected to very rough handling without losing their shape, while others are so curiously formed of stiff grass-stalks that their exterior bristles with sharp points like the skin of a hedgehog. Many of the weaver-birds are brightly marked. They feed on seeds and insects, especially beetles. See NESTS OF BIRDS. Revised by F. A. LUCAS.

Weaving: the act or art of forming from threads or filaments any textile fabric. These fabrics are formed in the machine called a LOOM (*q. v.*), and in a general way may be said to be formed of two series of threads or filaments interlaced at right angles, technically known as warp and filling. In the length of the fabric the threads are warp, and those which interlace with the warp are the filling threads. Notwithstanding the great variety of textile fabrics, there are but three underlying principal movements in their formation—that is, in weaving; these may be arrived at in various manners and by many different mechanisms, but are, without exception, to be found in the following order: "shedding," "picking," and "beating up." The warps may be arranged in the looms differently; they may be on a single warp-beam at the back, or on more than one; the warp-threads are drawn through the eyes of the various loom-harness and through the reed—usually before the warp is placed in the loom—then fastened to the cloth-roll at the front, and the warp is ready to be woven. The first movement is to form a shed; this is accomplished by raising some of the loom-harness and depressing others, thereby raising a part of the warp-threads and lowering the remainder; the space between these two parts of the divided warp is the shed. The second movement is to pass through this shed the filling, after which the third movement, to complete the formation, is to beat up the filling-thread toward the cloth-roll. Another shed is formed, as before, a new filling-thread picked—that is, thrown across and through the shed—this thread beaten up against the one which preceded it, and these three movements, continually repeated, produce the fabric and constitute the operation of weaving.

Origin of the Art.—It is not known who were the first to practice weaving, when it was first practiced, or what fabric was first produced; yet the art is well classed as one of the earliest. The Chinese claim that they have certain documents or records which show silk-weaving to have been practiced over twenty-five centuries before the Christian era. By some archæologists Egypt is credited with being the mother of the invention. Joseph Strutt says in *View of the Dress and Habits of the People of England*, "The Egyptians put a shuttle in the hands of their goddess Isis to signify that she was the inventress of weaving." Several references in the Bible narrative (Lev. xiii. 47–59, etc.) to "warp and woof" show that in the fifteenth century before Christ the Israelites were familiar with the art. It is very evident that among the Hindus, Chinese, and Egyptians the art has been practiced for many centuries. The fact that several countries widely separated seem to have practiced weaving extensively as far back as history or tradition goes, and also that in principle the practice of weaving to-day is not different from that of the most remote methods reported, would help to substantiate the belief that mechanisms for weaving may have been invented independently by several races.

Weaving in India.—Even to the present time many Hindus hold to their primitive mode of making textiles, and cause much wonder by producing fabrics of great delicacy and beauty. They have acquired by their continued application to old customs patience, alacrity, and a great delicacy of touch, enabling them to equal, except in quantity, the output of some of the best modern looms, and all with the simplest of appliances. These are described in the

Circle of Mechanic Arts by Martin, as follows: "The loom consists merely of two bamboo rollers, one for the warp and the other for the web" (woven cloth) "and a pair of gears. The shuttle performs the double office of shuttle and batten, and for this purpose is made like a huge netting-needle, and of a length somewhat exceeding the breadth of the cloth. This apparatus the tanty (weaver) carries to a tree, under which he digs a hole large enough to contain his legs and the lower part of the gear. He then stretches his warp by fastening his bamboo rollers at a due distance from each other on the turf by wooden pins. The balance of the gear he fastens to some convenient branch of the tree over his head. Two loops underneath the gear, in which he inserts his great toes, serve instead of treadles, and his long shuttle, which also performs the office of batten, draws the weft through the warp, and afterward strikes it up close to the web."

Growth of the Art.—History discloses the fact that the manufacture of fabrics kept moving westward from Egypt and Asia, as did civilization. Italy seems to have been the first European country to enter into woolen and cotton manufacturing, and it was from Italy that the other European countries obtained a knowledge of the art. In the tenth century Flanders led in the manufacture of woolens. "The art of weaving seems to be a gift bestowed upon them by nature," one author states in writing of the Flemings; and another, that "all the world was clothed from English wool wrought in Flanders." This was up to the eleventh century, and during that century, while William the Conqueror was King of England, the Flemings came into England in large numbers, and introduced wool-manufacturing. Later, in the early part of the twelfth century, in the reign of Henry I., many more immigrated into England, and the beginning of one of her principal industries was made. Just when cotton fabrics were first produced in England is not known, but early in the seventeenth century, Roberts, in *Treasures of Traffic*, in speaking of Manchester, says, "they buy cotton wool in London that comes from Cyprus and Smyrna, and work the same into fustians, vermilions, and dimities, which they return to London." The art may be said to have been introduced into America by the Puritan settlers of New England early in the seventeenth century.

In the nineteenth century weaving as an industry has taken wonderful strides. This was and is due to the improvements in the loom. Up to 1785 the power-loom was unknown, nor was it a success until the beginning of the nineteenth century. Hand-weaving had alone been practiced, and the weaving was done by the operators in their own homes, they having in most cases spun their own yarns. The development of machinery for preparing yarns, beginning about the middle of the eighteenth century, was a step which greatly increased the demand for an improved loom, a loom that would automatically produce the movements then made by the hands and feet of the weaver. The hand-loom in use in the eighteenth century was still very simple, the first improvement of note being that of the shuttle motion. The shuttle, until the invention of the "fly-shuttle" by Kay in 1733, was thrown through the shed from and by the hand of the weaver; by an arrangement of springs and straps, it was now driven from a box at one end of the batten or lathe through the shed, to a box at the opposite end; the propelling power was the hand still, but imparted to the shuttle through the strapping. Soon after this the rising and falling shuttle-box was introduced, which allowed the entrance of various colored filling-threads without stopping the loom. Even with this improvement, weaving was not an easy or rapid operation; the shed for all that had to be formed by the depressing of the treadles connected with the harness by the weaver, and the filling must be beaten up against the woven cloth by hand.

Cartwright, in 1785, having never seen any one weave, and though not a mechanic, but a minister of the Church of England, conceived the idea of producing textile fabrics automatically, and after one or two attempts gave to the world a loom approaching very nearly in form as well as principle the modern plain loom. On the foundation thus laid other inventors have built, until to-day the loom combines some of the most wonderful mechanical inventions, and produces fabrics automatically and with rapidity, which equal if not excel the most beautiful made by hand.

Ribbon-weaving.—As early as 1745 John Kay, with an associate, secured patents for a ribbon-loom which could be run by power; the loom was really only the "Dutch engine loom" remodeled and improved; and from all available reports the improved loom seems to have been very similar in construction to the ribbon-loom of to-day except that the speed was much slower and the movements of the various harness very limited.

Ribbon-weaving is accomplished in a compound loom, having but one set of harness and one lathe or batten, yet a series of warp-beams and individual rollers for the woven ribbon, each warp also having its own shuttles. These shuttles work positively—that is, are not thrown across, but are passed through the sheds of their respective warps by a rack-and-pinion arrangement, the shuttle passing through one warp taking the place of the shuttle which simultaneously passes in the same direction through the shed of the next adjoining warp, and so back again as the shuttles move in the opposite direction. By this arrangement as many as thirty or forty ribbons or tapes may be woven at once in the same loom. The application of the Jacquard machine to the ribbon-loom, and the box-motion, allowing the use of five or six different shuttles, have so developed ribbon-weaving that some of the most beautiful textiles are these narrow fabrics. The early application of power to the ribbon-loom seems to have had no connection with the development of the modern power-loom, however.

Weaving by Power.—The application of power to the loom necessitated, among the many attachments, an arrangement whereby the loom would stop if the filling should become exhausted in the shuttle or should break; an attachment to wind up the cloth-roll automatically and keep the warp at an even tension; also a mechanism to stop the loom if the shuttle failed to reach its destination. Should the shuttle get caught in the shed, without something to stop the loom before the stroke of the lathe the warp would be broken out. After numerous improvements and many different inventions toward the same end, the weaver has reached a point where he has but little to do with a single loom. On plain white fabrics of cotton, as sheetings and shirtings, one weaver can run from six to eight looms, running from 180 to 250 picks a minute, and on heavy woolen or worsted suitings, woven on broad looms, one weaver can keep two running with a speed of ninety to ninety-five picks. Comparing this speed and the increased production with the varying production of the hand-loom, one weaver to a loom, the product of which was governed by his physical ability and endurance, the wonderful advance made during the nineteenth century will be readily understood.

Filling Stop-motion.—While there are many different stop-motions used by weavers and loom-builders, the description of one may answer for all. The object being to stop the loom when the shuttle leaves no thread in the shed as it passes through, a "filling-fork" is arranged on the loom-lathe in connection with a series of levers which control the driving motion of the loom; this fork is held in such a position by the filling-thread that it can not touch the levers, but so soon as the shuttle passes without leaving a filling-thread, the fork, having nothing to hold it away from the levers, comes in contact with them and immediately stops the loom. For extremely fine fabrics this stop-motion must be very delicate and carefully adjusted.

Shuttle Protector.—In 1796 an invention, still used, was made, called the "stop-rod motion," designed to stop the loom when the shuttle fails to pass entirely through the shed. It consists of an iron rod which runs the width of the loom on the face of the lathe, having a dagger projecting toward the breast-beam at the front of the loom, and fitted with an arm at each end, these arms being in contact with certain fingers on the shuttle-boxes at either end of the lathe. When the shuttle enters the box the finger is pressed outward and the arm in contact with it gives a vibrating motion to the rod just as the filling is being beaten up; should the shuttle not enter the box, however, the rod is left in such a position that the dagger strikes a lever so arranged as to immediately stop the loom and hold the lathe at a distance, so that none of the warp-thread may be broken, even in case the shuttle is in the shed at the time.

Another means to prevent the breaking of the warp, used principally in silk-weaving, is the "loose reed." The reed is hinged at the top and is held firmly as the lathe beats up so long as the shuttle is in the shuttle-box, but is released at the bottom and swings away from the cloth should the shuttle not reach the box, stopping the loom.

Jacquard Weaving.—More than to any other invention the artistic quality of textiles is due to the Jacquard machine (see LOOM) and to its subsequent development. The machine may be attached to a great variety of looms, from

those weaving narrow brocade ribbons to those immense looms weaving rugs, tapestries, art-squares, etc., some 8 or 10 yards broad. This class of weaving requires great skill in adjusting the mechanism of the loom and likewise great care and skill on the part of the weaver, though the machine has been brought to such a state of perfection that it may be handled with the ease of much simpler looms.

Pile Weaving.—Under this head would come the weaving of all pile carpetings, velvets, plushes, etc. The general construction of each is similar; a body-warp and a pile-warp are bound together by a single filling which interlaces with the body-warp. A shed is formed with the warp thread for the pile raised, and a small wire rod is inserted and beaten up, the pile-warp is lowered, and the filling interlaces again with the body-warp, binding the pile-warp into the body of the fabric; this arrangement continues, and after ten or twelve loops have been formed the wires, which have been left in the loops they have helped to form, are withdrawn one at a time, and again inserted in succeeding sheds to form other loops. For the Brussels carpet and all loop-pile fabrics the wires are round, but for fabrics with a cut pile they are fitted with a knife at one end which cuts the loop as the rod is withdrawn; or the rods may be grooved on one side, as for velvet-weaving, and the cutting be done by running a trivet—a small knife made for the purpose—along the groove in the rod and under the loops.

Much of interest could be said of gauze-weaving, for which the warps are mounted specially in the loom, and are usually woven from more than one warp-beam, and terry-weaving—the production of Turkish towels—woven both on the pile-fabric principle and in specially arranged looms. The weaving of glass-cloth is particularly interesting. The fabric is formed as if it were silk, with each third or fourth pick of spun glass; the loom stops on the shed for the glass filling, and this is inserted by hand, the strand of spun glass being placed on a narrow flat strip of wood which is passed through the shed and deposits the glass strand between the warp-thread; the strip of wood is removed, the glass filling beaten up, three or four picks of silk inserted to bind it, another glass thread placed in its shed, and so on. There are also hair-cloth-weaving, upholstery-weaving, the weaving of wire-cloths, and the weaving of many specially constructed fabrics on looms built purposely to produce them, or by means of adjustments of the ordinary looms. See COTTON MANUFACTURES, TEXTILE-DESIGNING, and TEXTILE FABRICS.

LOUIS CLARK.

Webb, ALEXANDER STEWART, LL. D.: soldier; son of James Watson Webb; b. in New York, Feb. 15, 1835; graduated at the U. S. Military Academy 1855, and became second lieutenant of Second Artillery; served in Florida and on frontier duty 1855–57; as Assistant Professor of Mathematics at West Point 1857–61; was promoted first lieutenant April 28, 1861, captain Eleventh Infantry May 14, and major of the First Rhode Island Artillery Sept. 14. He was engaged in the battle of Bull Run July 21; served in the defenses of Washington, and with the Army of the Potomac in the Virginia Peninsula campaign; was chief of staff Fifth Corps until June 23, 1863, when he was commissioned a brigadier-general of volunteers and assigned to the Second Corps. At Gettysburg his brigade met the assault at the angle on the third day, where Gen. Webb was wounded. He received a bronze medal for his gallantry in this action. In the subsequent operations of the campaign he commanded a division (Second Corps), gaining the brevet of lieutenant-colonel for gallantry at Bristow Station Oct. 14, 1863. In the Richmond campaign of 1864 he led a brigade in the battles of the Wilderness and Spottsylvania, being severely wounded in the latter fight (May 12), and, disabled from active service, he served as chief of staff to Meade from Jan., 1865, till the surrender of Lee, and subsequently, until Feb., 1866, as acting inspector-general of the military division of the Atlantic, having been mustered out of the volunteer service the month previous. In July, 1866, he was appointed lieutenant-colonel Forty-fourth Infantry, and served at West Point until 1868. He was in command of his regiment and on other duty thereafter until Dec. 2, 1870, when he was honorably discharged. In 1869 he accepted the presidency of the College of the City of New York. He was breveted major-general U. S. volunteers, and colonel, brigadier-general, and major-general U. S. A. He published *The Peninsula: McClellan's Campaign of 1862* (New York, 1882), and articles on the war in *The Century* magazine.

Webb, CHARLES HENRY: humorist; b. at Rouse's Point, N. Y., Jan. 24, 1834; ran away to sea when a boy, and, returning after three years, went into business in Chicago. From 1860 to 1863 he was on the staff of *The New York Times*. In 1863 he went to California, and in the following year founded *The Californian*, which he edited till 1866; wrote for other San Francisco papers and for the Eastern magazines; became a well-known humorous correspondent of *The New York Tribune* and other papers under the signature of John Paul, and traveled in Europe in that capacity 1876. He afterward became a banker and broker in New York. He is the inventor of an adding-machine, and author of several burlesque dramas; also of *John Paul's Book* (1874); *Parodies, Prose and Verse* (1876); and *Vagrom Verse* (1889). Revised by H. A. BEERS.

Webb, GEORGE JAMES: composer; b. in Wiltshire, England, June 24, 1803; removed to the U. S. in 1830; was for many years professor in the Boston Academy of Music; in 1871 removed to New York; prepared, with T. B. Hayward, *The Musical Cabinet* (1832), and with William Mason *The Melodist*; contributed to William Russell's *Orthophony* (24th ed. 1864), and was author of *The American Glee-Book*, *The Common-School Songster*, *The Vocal Class-Book for Schools*, *The Massachusetts Collection of Psalmody*, and other musical works. D. at Orange, N. J., Oct. 7, 1887.

Webb, JAMES WATSON: journalist and diplomat; son of Gen. Samuel B. Webb; b. at Claverack, N. Y., Feb. 8, 1802; entered the U. S. army as second lieutenant of artillery Aug., 1819; was promoted to a first lieutenancy in 1823, and the next year was made assistant commissary of subsistence; became adjutant Third Infantry 1826; was stationed in 1820 at Chicago, twelve years before the first house was erected there; in 1827 resigned his commission and took charge of *The Morning Courier*, which had been established in New York in May of that year; in 1829 purchased *The Enquirer* and united the two under the name of *The Morning Courier and New York Enquirer*, and became sole editor, and the next year sole proprietor—positions he held for thirty-four years, until the absorption of the paper by the *World*. This journal was at an early period identified with the interests of the Whig party, and was an able advocate of its principles. In 1851 Gov. Hunt, of New York, appointed him engineer-in-chief of the State of New York, with the rank of major-general. In 1849 he was appointed minister to Austria, and in 1861 to Turkey, but did not accept either appointment. In 1861 he was appointed by President Lincoln envoy extraordinary and minister to Brazil, where he served two terms of four years each. Being in Paris in 1865, he negotiated a secret treaty with the Emperor Napoleon for the removal of the French troops from Mexico. Gen. Webb resigned the mission to Brazil in 1869, and afterward resided in New York city. He published *Altowan, or Incidents of Life and Adventure in the Rocky Mountains* (2 vols., New York, 1846); *Slavery and Its Tendencies* (Washington, 1856); and a pamphlet on *National Currency* (New York, 1875). D. in New York, June 7, 1884.

Webb, SAMUEL BLATCHLEY: soldier; b. at Wethersfield, Conn., Dec. 15, 1753; joined the Revolutionary army, and took part in the battle of Bunker's Hill, where he was wounded. He was soon appointed aide-de-camp to Gen. Putnam; became private secretary and aide-de-camp to Gen. Washington, with the rank of lieutenant-colonel, June 21, 1776; was engaged in the battles of Long Island and the Brandywine; was wounded at White Plains and at Trenton; raised, and organized almost entirely with his own funds, the Third Connecticut Regiment, of which he took command 1777; was captured with his regiment by the British fleet in Gen. Parsons's unfortunate expedition to Long Island Dec. 16, 1777, and not exchanged until 1780, when he succeeded Baron Steuben in the command of the light infantry, with the brevet rank of brigadier-general; was an intimate and trusted friend of Washington throughout the war, and subsequently was one of the sixteen officers who founded the Society of Cincinnati at Newburg-on-the-Hudson June 19, 1783: and was selected to hold for Washington the Bible on which he took the oath of office as first President of the U. S. in New York city in 1789. In the same year he settled at Claverack, Columbia co., N. Y., where he died Dec. 3, 1807.

Webb, SIDNEY, LL. D.: social economist; b. in London, England, July 13, 1859; educated in Switzerland and Mecklenburg-Schwerin; second Whewell scholar in international law and moral and political philosophy, Cambridge; Bacon scholar, Gray's Inn; was awarded a studentship for Roman

law and jurisprudence by the council of legal education, Trinity, 1883; called to the bar, Trinity, 1885; entered civil service Dec. 2, 1878; resigned 1891. He is the author of *Socialism in England* (1889); *The Eight Hours' Day*, in conjunction with Harold Cox (1891); and *The London Programme* (London, 1892).—His wife BEATRICE (*Potter*) is author of *The Co-operative Movement in Great Britain.*

Webb, THOMAS E.: See the Appendix.

Webb City: city (founded in 1876); Jasper co., Mo.; on the Kan. City, Ft. Scott and Mem., the Mo. Pac. and the St. L. and San Fran. railways; 9 miles S. byW. of Carthage, the county-seat (for location, see map of Missouri, ref. 7–E). It is a lead and zinc mining center, with a weekly output valued at $25,000, and is surrounded by an agricultural and fruit-growing region. There are 8 churches, high-school building (cost $30,000), 2 ward schools (cost $10,000 and $6,000), 2 opera-houses, water-works system (cost $100,000), electric lights, electric railway connecting with Carthage and Centerville, a national bank with capital of $50,000, 2 State banks with combined capital of $50,000, and a weekly and 3 daily newspapers. Pop. (1880) 1,588; (1890) 5,043; (1900) 9,201. EDITOR OF "REGISTER.

Webbe, WILLIAM: author; b. in England in the sixteenth century; received a university education; translated Vergil's *Georgics* into English hexameters, and published *A Discourse of English Poetrie, together with the Author's Judgment touching the Reformation of our English Verse* (London, 1586), republished in vol. ii. of Haslewood's *Ancient Critical Essays upon English Poets and Poetry* (2 vols., 1811–15), and edited by Edward Arber in vol. xi. of his *English Reprints* (1870). Webbe also wrote *Tancred and Gismund, a Tragedy* (1592). Revised by H. A. BEERS.

Webber, CHARLES WILKINS: journalist and explorer; b. at Russellville, Ky., May 29, 1819; went in 1838 to Texas, then struggling for independence; was for several years connected with the famous Texan Rangers, seeing much of wild and adventurous life on the frontier; returned to Kentucky and studied medicine; afterward entered Princeton Theological Seminary with a view to the Presbyterian ministry, but abandoned that purpose, and settled in New York as a writer for literary periodicals, especially *The New World*, *The Democratic Review*, and *The Sunday Despatch*; was associate editor and joint proprietor of *The Whig Review*; projected, with the two sons of his friend Audubon the naturalist, a monthly magazine of mammoth size, to be illustrated with copper-plate colored engravings by Audubon, but published only the first number; was engaged in an unsuccessful attempt to lead an exploring and mining expedition to the region of the Colorado and Gila rivers 1849, and in 1855 went to Central America, where he joined the filibuster Walker in Nicaragua, and was killed in a skirmish on Apr. 11, 1856. He was the author of *Old Hicks the Guide, or Adventures in the Comanche Country in Search of a Gold-Mine* (1848); *The Gold-Mines of the Gila* (1849); *The Hunter Naturalist, etc.* (1851), with 40 engravings from original drawings by Mrs. Webber; *Wild Scenes and Song-Birds* (1854), with 20 colored illustrations from drawings by Mrs. Webber; *Tales of the Southern Border* (1852); *Spiritual Vampirism* (1853); *Shot in the Eye*, and *Adventures with the Texan Rifle Rangers* (1853), and other works. Revised by H. A. BEERS.

Weber, vā'ber, ERNST HEINRICH: physiologist; b. at Wittenberg, Germany, June 24, 1795; studied medicine at Leipzig, and was appointed Professor of Comparative Anatomy there in 1818; in 1840 also of Physiology. His principal works are *Anatomia Comparativa Nervi Sympathici* (1817); *De Aure et Auditu Hominis et Animalium* (1820); *Lehre vom Bau und von der Verrichtung der Geschlechtsorgane* (1846); *Der Tastsinn* (in vol. iii. of Wagner's *Handwörterbuch der Physiologie*); and a number of minor essays and monographs collected in 1851 under the title *Annotationes Anatomicæ et Physiologicæ.* D. in Leipzig, Jan. 26, 1878.

Weber, FRIEDRICH ALBRECHT: Sanskrit scholar; b. at Breslau in Silesia, Feb. 17, 1825; educated at the Universities of Breslau, Bonn, and Berlin, 1842–45; privat docent at Berlin 1848–56; assistant professor 1856–67; Professor of Sanskrit University of Berlin since 1867; member of the Royal Academy; editor or author of *White Yajurveda* (3 vols., London, 1849–59); *Indische Studien* (17 vols., Berlin, 1849–89); *Indische Skizzen* (1857); *Indische Streifen* (3 vols., 1868–79); *Vorlesungen über ind. Literaturgesch.* (1852; 2d ed. 1876); *Verzeichniss der Sanskr. Handschriften der kgl. Bibliothek* (2 vols., 1853–92); *Malavikā und Agnimitra übersetzt* (1856); also various lesser works and contributions to the *Abhandl. der kgl. Acad. d. Wissensch.* B. I. W.

Weber, GEORG: historian; b. at Bergzabern, in Rhenish Bavaria, Feb. 10, 1808; studied first theology, afterward history and literature, at Erlangen; spent several years in Heidelberg as tutor in an English family; visited Switzerland, Italy, and France, and was appointed director of the normal school of Heidelberg. He published *Lehrbuch der Weltgeschichte* (2 vols.); *Geschichte der Deutschen Litteratur*; *Allgemeine Weltgeschichte für die gebildeten Stände* (15 vols., 1857–80), and, with M. H. Holtzmann, a history of the Hebrew people and the origin of Christianity (2 vols., 1867). D. at Heidelberg, Aug. 10, 1888.

Weber, KARL MARIA FRIEDRICH ERNST, Baron von: composer; b. at Eutin, near Lubeck, Germany, Dec. 18, 1786; early showed a talent for art, especially for music, but received a rather forced and desultory education, as his father—successively a soldier, a financial agent, a chapel-master, and then the leader of a band of strolling actors—wished to make him a musical prodigy, such as Mozart had been. Wandering about from place to place, young Weber published in 1798 his first composition, six fughetti for the piano, and wrote his first opera, *Die Macht der Liebe und des Weins.* The result, however, did not answer his expectations, and for a couple of years father and son devoted themselves to the improvement of the recent invention of lithography by Senefelder. In 1800 their enthusiasm and means of subsistence were spent. Young Weber returned to his art, and produced the opera *Das Waldmädchen*, which was performed at Chemnitz, and in the following year *Peter Schmoll und seine Nachbarn*, which was performed in 1802 at Augsburg; neither of these works, however, produced any great effect. In 1803 he went to Vienna, where he studied under Abbé Vogler, a spirited and peculiarly gifted teacher of music, and by his recommendation he received in 1804 a place as director of music at the theater of Breslau. Here he began to compose a great opera, *Rübezahl*, which he never finished, and of which only the overture exists in a much altered form, *Der Beherrscher der Geister*; but the place did not agree with his tastes, and in 1806 he became private secretary to Duke Ludwig of Würtemberg. At this, the most dissolute court in Europe, he spent four years in idleness and dissipation. In 1810 he left Ludwigsburg morally and bodily impaired, in debt, and in disgrace. Once more he met with Abbé Vogler in Darmstadt, and under the influence of the atmosphere which he breathed here he again took up music, composed the cantata, *Der erste Ton*, several sonatas, overtures, etc., transformed the *Waldmädchen* into the *Sylvana*, which was performed with some success at Frankfort, and wrote the operetta *Abu Hassan.* After traveling in Germany and Switzerland, he settled in 1813 in Prague as director of the opera, and remained there till 1816, doing good service and establishing for himself a wide reputation. He possessed great ability as an operatic manager, and his music (in 1814) to Körner's war-songs, among which were *Lützows wilde Jagd*, *Schwertlied*, etc., and his great cantata *Kampf und Sieg* after the battle of Waterloo, were true revelations of his genius, and spread his fame all over Germany. In 1816 he went to Dresden as director of the royal opera. The place was not without difficulties. The Italian opera was the pet of the court, and the great work of Weber's life was to drive the Italian opera out of Germany. Not one of his great operas was first brought on the stage in Dresden. *Preciosa* and *Der Freischütz* were first performed at Berlin, Mar. 15 and June 18, 1821, *Euryanthe* at Vienna Oct. 25, 1823, and *Oberon* at London Apr. 12, 1826. The success of *Der Freischütz*, however, was instantaneous and very great. In Berlin it annihilated the influence of Spontini. It became a favorite on the operatic stage of Northern and Central Europe; it exercised a decided influence on Marschner and Mendelssohn, on Meyerbeer and Auber, on all modern music, even on Richard Wagner; and as it was the first, it is still one of the freshest musical embodiments of the romantic spirit. Weber conducted in person the first performance of *Oberon*, and died soon after, June 5, 1826, in London. He was buried in Moorfields chapel, but in 1844 his remains were taken to Dresden, where in 1860 a fine statue of him by Rietschel was raised in front of the theater. His *Autobiography* and other writings were edited in 1828 in 3 vols. by Theodor Hell. Revised by DUDLEY BUCK.

Weber, WILHELM EDUARD: physicist; brother of ERNST HEINRICH WEBER; b. at Wittenberg, Oct. 24, 1804; studied

natural science at Halle; was appointed Professor of Physics at Göttingen in 1831, but dismissed in 1837 for political reasons; accepted a chair in 1843 at Leipzig, but returned in 1849 to Göttingen, and died there, June 23, 1891. In connection with his brother, Ernst Heinrich, he published in 1825 *Die Wellenlehre*; in 1836, with his brother Eduard Friedrich (1801–71), *Mechanik der Menschlichen Gehwerkzeuge*; and in 1840, in connection with Gauss, *Resultate aus den Beobachtungen des magnetischen Vereins*, with an *Atlas des Erdmagnetismus*. From 1846 to 1867 he also published a series of essays on the connection between electricity and magnetism under the title *Elektrodynamische Massbestimmungen*. Physical science is indebted to him for the demonstration by experiment of two fundamental laws concerning the working of the electro-dynamic force which had formerly been applied by Ampère as mere hypothetical inferences.

Weber River: a river of Utah. It rises on the west slope of the Uinta Mountains, flows northwestward through a series of cañons connecting agricultural valleys for 175 miles, and empties into Great Salt Lake near the middle of its eastern shore. The wild gorge made by the river through the Wasatch Mountains, known as Weber Cañon, is traversed by the Union Pacific Railway between Echo and Ogden. The mean volume of the river at Ogden is estimated at 2,000 cubic feet per second. Its waters are extensively used for irrigation. At Ogden there is an immense delta built by the river in ancient Lake Bonneville. ISRAEL C. RUSSELL.

Weber's Law: See PSYCHO-PHYSICS.

Webster: town (incorporated in 1832); Worcester co., Mass.; on the French river, and the Boston and Albany and the N. Y. and New Eng. railways; 16 miles S. of Worcester (for location, see map of Massachusetts, ref. 3–F). It contains Chaubunagungamaug Lake of 1,225 acres; has 7 Protestant and 3 Roman Catholic churches, a high school, 13 graded schools, 3 parochial schools, public library, a national bank with capital of $100,000, a savings-bank with deposits of over $1,000,000, and 2 weekly newspapers; and is principally engaged in the manufacture of cotton and woolen goods and shoes. It has a self-sustaining water-works system, electric lights, and 2 hotels, and in 1894 had a revenue of $53,000, expenditures of $48,000, assessed valuation of $3,124,707, and no debt. Pop. (1880) 5,696; (1890) 7,031; (1900) 8,804. REV. HENRY A. BLAKE.

Webster, DANIEL: orator and statesman; b. at Salisbury, N. H., Jan. 18, 1782; the son of Ebenezer Webster, an officer in the Revolutionary army, and a descendant of Thomas Webster, who settled in New Hampshire about 1636. On account of feeble health Daniel was educated at home and by private tuition in his boyhood, but spent nine months at the Phillips Academy, Exeter, where he showed an extraordinary fondness for reading, and great powers of memory. In 1797 he entered Dartmouth College, where, though he never became distinguished as a student, he acquired great reputation on account of his unusual gift for clear and forcible expression as a speaker. He was a great reader of history, and acquired considerable familiarity with the Latin authors. For one year he edited a weekly newspaper, and his fame as a speaker was such that when he was eighteen he delivered an oration at Hanover on July 4, 1800. In 1801 he began the study of law in an office at Salisbury, but was soon forced to interrupt his studies and teach school, in order to contribute to the support of his family. While teaching in Freiberg, Me., he increased his income by working as a copyist in the office of the Register of Deeds. During this period he delivered a Fourth of July oration which emphasized the necessity of strictly adhering to the Constitution, thus showing already the bent of his mind. After a year he returned to the study of law, and later entered the law office of Christopher Gore, in Boston. Admitted to the bar in Mar., 1805, he began the practice of law in Boscawen, N. H., and on the death of his father, in 1807, assumed his debts and the support of the family. In the following year he removed to Portsmouth, and almost immediately rose to prominence at the bar. At this time of his life he profited greatly from the friendship and advice of Jeremiah Mason, the foremost lawyer of the State, and one of the greatest advocates of the time. Webster was not only admired for his abilities, but was personally popular for his social qualities. His income was now ample, but his tastes were not simple, and he had become so accustomed to debt that henceforth he almost seemed to regard it as the normal condition of mankind.

Early attracted to politics, he showed his fitness for a political career by his occasional addresses and speeches. He had inherited strong views as a Federalist from his father, and the cast of his mind was peculiarly conservative. In 1804 he published a pamphlet entitled *An Appeal to the Old Whigs*; in 1805, a Fourth of July oration at Salisbury; in 1806, another at Concord; and in 1808, a pamphlet on the *Embargo*, in all of which the prominent thought is the importance of the Constitution and the republic. In 1809 he delivered a Phi Beta Kappa oration on *The State of Our Literature*, but at this period he was chiefly absorbed in the practice of his profession. In his Fourth of July oration in 1812 he set forth his attitude toward the war. Maintaining that "maritime defense, commercial regulations, and national revenue" were the corner-stones of the Constitution, he declared that these interests had been abused by the course of the Government, and he held that the navy had been neglected because the Federalists had advocated its improvement and increase. In one particular he departed from the policy of the New England Federalist. He said: "With respect to the war in which we are now involved, the course which our principles require us to pursue can not be doubtful. It is now the law of the land, and we certainly are bound to regard it. Resistance and insurrection form no part of our creed. . . . If we are taxed to carry on this war, we shall disregard certain distinguished examples and shall pay. If our personal services are required, we shall yield them to the precise extent of our personal liability. At the same time the world may be assured that we know our rights and shall use them. We shall express our opinions on this, as on every measure of the Government—I trust without passion, I am certain without fear. By the exercise of our constitutional right of suffrage, by the peaceable remedy of election, we shall seek to restore wisdom to our councils and peace to our country." This shows his attitude toward an unpopular law. With him the only way to deal with it was to make it appear unwise by popular discussion, and procure its repeal. This oration, so consonant with his subsequent attitude on the Fugitive Slave law, was widely circulated, and caused his election to the Thirteenth Congress, in which he took his seat in May, 1813. He was at once made a member of the committee on foreign relations, and his speeches in the House soon made it clear that he was not only the foremost man of the party, but one of the ablest leaders in Congress. In the course of the discussion of the project for a national bank, he laid the foundation of his fame in financial matters. Opposing a measure which would have led to inflation, he declared himself the foe of irredeemable paper. The bill was lost by a single vote, but, moved by the entreaties of Calhoun, Webster consented to its reconsideration, and after its objectionable features were removed it was passed. In the Fourteenth Congress he introduced a resolution requiring all Government dues to be paid in coin, in treasury notes, or in notes of the Bank of the United States, and in a speech of great power showed the absolute necessity of a specie basis in all financial matters. His resolution brought about specie resumption, and established a sound currency. In 1816 he removed to Boston, and for the next seven years devoted himself to practice. When he began his career at Boston, at the age of thirty-four, he had become one of the leading lawyers in the land, and had established a reputation as one of the most powerful speakers in Congress, and one of the ablest statesmen in the country in matters of finance. He had already defined his position on the tariff as a free-trader in principle, and a very moderate protectionist when protection was unavoidable; had opposed the war, but had kept himself entirely clear of the separatist movement in New England, which had found expression in the HARTFORD CONVENTION (*q. v.*). On Mar. 10, 1818, his argument in the celebrated Dartmouth College case not only called to himself the admiration of the whole people, but, notwithstanding the adverse prepossessions of a majority of the judges, secured one of the most important decisions ever rendered by the Supreme Court. It has been estimated that gifts to educational and other beneficent institutions amounting to more than $500,000,000 have been protected from legislative interference by the decision thus secured. His oration of Dec. 22, 1820, on the two-hundredth anniversary of the landing of the Pilgrims at Plymouth, placed him at the very head of American orators, and in the opinion of many proved him the equal of the most eloquent speakers of England or the Continent. John Adams, who had been present at the trial of Hastings, declared that Burke was no longer entitled to be called the greatest of

modern orators. The profound impression made by the Plymouth oration was deepened by that on the laying of the corner-stone of Bunker Hill Monument in 1825, and by the eulogy on Adams and Jefferson one year later. These, the most important of his occasional addresses, were followed in the course of years by one on *Science in Connection with the Mechanic Arts*; one on the *Character of Washington*; one on the occasion of laying the corner-stone for the enlargement of the Capitol at Washington; and one on the death of Judge Story.

He was re-elected to Congress from the Boston district in 1822, and took his seat in 1823, at the very time when the old party lines were breaking down. Within a few days of his appearance in the House, he delivered a remarkable speech in support of the motion which he had introduced to provide for a commissioner to inquire into the affairs of Greece. While deprecating any intermeddling on the part of the U. S. with European affairs, he showed that the country still had an important duty to perform in the exercise of a proper influence on the public opinion of the Old World, and he discussed the great question of the future destiny of the U. S. in its relation to other nations. During the same session as chairman of the judiciary committee he defended with much difficulty, but with final success, the Supreme Court against the attempts made to curtail its powers. At a later period he also carried through a measure for its reorganization and the increase of the number of judges. In the second session of this Congress he defined his position on the general subject of internal improvements by his great speech on the *Cumberland Road*, taking the ground that this line of policy must be carried out from the purest national motives. He also defended the policy of selling public lands at a low price to encourage immigration. The speech was that of a national statesman, and it greatly enhanced his reputation, especially throughout the West. During this same period of his career he was prominent in debates on the tariff, and as a representative of the New England Federalists proposed the promotion of commercial interests by a moderate tariff which should lead to free trade. In one of his great speeches on the subject of protection, he said: "It is the true policy of Government to suffer the different pursuits of society to take their own course, and not to give excessive bounties or encouragements to one over another. This also is the true spirit of the Constitution. It has not, in my opinion, conferred on the Government the power of changing the occupations of the people of different States and sections and of forcing them into other employments." This passage is of great significance in showing his spirit before 1824; because when the tariff of that year, notwithstanding his opposition to it, was passed, he regarded the policy of the country as reversed, and from that time forward was a supporter of what Henry Clay called "the American policy" of protection. In 1828 he defended his course by declaring that the country had adjusted itself to the new conditions, and that steadiness and permanency of policy were of the utmost importance, but this new attitude subjected him at that time and ever afterward to severe criticism.

While he was delivering his speech on the tariff of 1824, he was informed that the Supreme Court had called for the next morning the great case of *Gibbons* vs. *Ogden*, which involved the constitutional right of the State of New York to grant a monopoly of its tide-waters. Webster worked all night in preparation, and in the morning made a speech of five hours, and secured a decision which Judge Wayne said "released every creek and river, every lake and harbor in the country from the interference of monopolies."

Elected to the Senate by the Legislature of Massachusetts in the year 1827, he was involved in the famous debate that arose from FOOTE'S RESOLUTION (*q. v.*), 1829, in regard to the methods of administering the public lands of the West. At this time the South was bitterly hostile to the tariff of 1828, and the nullification doctrines of 1798 and 1799 (see NULLIFICATION) were reasserted with great energy. The resolution led to a discussion of the question of the constitutional rights of the Federal Government and of the individual States. It also involved the question of the right of the individual States to nullify an act of the general Government, and withdraw from the Union. The most important characteristic of Webster's political creed had ever been a spirit of nationalism as distinguished from the spirit of sectionalism. He was in consequence peculiarly well fitted by his political history to be the champion of the Union cause. As he himself said, his whole life had been a preparation for the reply to Hayne. His speech of Jan. 26, 1830, proclaimed the doctrine of nationalism, and depicted the direful results of nullification with such eloquence and power that the views expressed became an integral part of the political creed of a vast majority of the people of the country. In the bank controversy of 1832, Webster criticised President Jackson's position in assuming the right to pronounce upon the unconstitutionality of the bank's charters, the Supreme Court having already pronounced upon them, and his speech revealed an extraordinary knowledge and grasp of financial subjects. The reputation thus gained was strengthened by his discussion of the President's course in the following campaign. After the removal of the deposits, Webster delivered in Boston a powerful speech in which he predicted the results that came in the financial crash of 1837.

Webster seemed a natural candidate for the presidency, but he had taken a prominent part in a great number of important matters, and had aroused opposition even in his own party. He supported the candidacy of Harrison, and became his Secretary of State. The great achievement of this period of his life was his negotiation of the Ashburton treaty, fixing the northeastern boundary-line between the U. S. and the British possessions. During Lord Palmerston's administration the irritation arising from the boundary dispute was such that war seemed imminent. Webster agreed with the opinion expressed years before by the Government of President Monroe, that the forty-ninth parallel would be a fair line of division in the Northwest; but the British had claimed a line as far S. as the Columbia river, while in the U. S. there had grown up a party whose watchword was "Fifty-four Forty or Fight." The death of Harrison, before the negotiations were concluded, obliged Webster to decide whether he would resign with his colleagues or remain in Tyler's cabinet, in order to complete a treaty of so great importance. He decided to brave the unpopularity of taking the latter course, and in so doing rendered the country a most valuable service; but although the treaty has since received the hearty approval of historical and diplomatic critics, it exposed Webster to considerable censure both from the "jingo" politicians of those days and from the equally numerous class that declared him a deserter from the Whig party, on account of his refusal to join his colleagues in abandoning President Tyler. In May, 1842, feeling that the treaty was secure, he resigned the secretaryship. A speech in defense of the Ashburton treaty was delivered in the Senate on Apr. 6 and 7, 1846, and will be found in his published writings. Though the northwestern boundary was not settled by this treaty, it was a hint given by Webster that led Great Britain to propose the line that was subsequently adopted. The next two years he devoted to his private affairs, and the practice of his profession. He supported Clay's candidacy in 1844, and on Mar. 4, 1845, returned to the Senate. In the next presidential campaign Webster was again spoken of as a candidate, but he had no prospect of success, and the party united on Gen. Taylor. Though opposed to the choice of a military candidate, and distrusting Taylor on account of the uncertainty of his political views, Webster in his Marshfield speech, while admitting that the nomination was "one not fit to be made," advised his friends to vote for Taylor, as a safer alternative than the Democratic candidate.

On the accession of Taylor the first great problem to demand a solution was the organization of the territory ceded to the U. S. at the end of the Mexican war. During his whole career, Webster had taken a prominent part in opposing not only the introduction of slavery into new territories, but also the acquisition of new territory into which slavery might be introduced. He had opposed the annexation of Texas, the Mexican war, and the treaty by which California and New Mexico had been ceded to the U. S., basing his opposition on the grounds, first, that the territory of the U. S. was already extensive enough, and, secondly, that the acquisition of new territory would involve at least the liability of the extension of slavery. Throughout his career his course in these matters had been vigorous, consistent, and well understood. When therefore the resolutions which made up what is known as the Clay compromise of 1850 were presented, many, not understanding the fundamental articles of his political creed, looked to him as the natural leader of the opposition. In this expectation they were, of course, disappointed. After his great speech on *The Constitution and the Union*, Mar. 7, 1850, he was grossly charged with an abandonment of a lifelong policy in order

to conciliate the South and secure its support two years later for the presidency. In judging his course at this time certain fundamental peculiarities of his political philosophy should be constantly kept in mind. While he had always been the foe of the extension of slavery, he had always urged the faithful execution of the laws and of the Constitution, and had regarded the preservation and the strengthening of the Union as of paramount political importance. Moreover, he had observed with pain the widening breach between the North and the South, which if not arrested, would, in his opinion, lead inevitably to secession, and he held that peaceable secession was impossible. It was but natural, therefore, that he should welcome any compromise not repugnant to his fundamental beliefs. It was to allay the prevailing excitement, to settle all questions in political dispute, and thus remove the danger of threatening disunion, that Clay came forward with the compromise measures of 1850. Before doing so, he called upon Webster and explained his purpose in detail. Webster at once gave his approval, and promised to support the compromise in the Senate. This he did in the masterly speech of Mar. 7, basing his action on the following propositions: First, the country is in danger of disunion; second, this danger has come from real grievances on both sides; third, these grievances must be removed by mutual concession, and by a just administration of the laws; fourth, the measures propose a just and reasonable solution of every political problem now disturbing the peace of the country; fifth, the failure to adopt these or similar measures may lead to secession, and peaceable secession is impossible. In arguing some of these points Webster gave great offense to many of his old friends in the North. For example, in regard to the abolition societies, he said: "I do not think them useful. I think their operations for the last twenty years have produced nothing good or valuable." Then, after showing how, in 1832, a debate occurred in the Virginia House of Delegates on a proposition for the gradual abolition of slavery, he pointed out that after the abolition movement began in 1835, slavery everywhere "drew back and shut itself up in its castle. The bonds of slaves were bound more firmly than before. Their rivets were more strongly fastened." He offended a still larger number by his refusal to sanction the application of the Wilmot proviso (see WILMOT, DAVID) to the newly acquired territory. The ground, he urged, was the general fact that the new territory was of such a nature that slavery could never be introduced into it, and that consequently to insert the proviso would accomplish nothing, and at the same time would greatly irritate the South by a course which would be interpreted as indicating an unwillingness to abide by the terms of the Missouri compromise. California had already applied for admission to the Union under a constitution with slavery excluded, and from New Mexico slavery had been excluded by nature herself. He concluded this part of his argument by saying: "Wherever there is a substantial good to be done, wherever there is a foot of land to be prevented from becoming slave territory, I am ready to assert the principle of the exclusion of slavery. I am pledged to it from the year 1837, I have been pledged to it again and again, and I will perform those pledges; but I will not do a thing unnecessarily that wounds the feelings of others or that does discredit to my own understanding." But perhaps he gave the most serious offense by his position in regard to the surrender of fugitive slaves. For him it was enough to stand by the plain requirement of the Federal Constitution that fugitive slaves should be delivered up to their owners. During the first forty years of the history of the Government the propriety of this constitutional provision had scarcely been questioned. Even now it was the fundamental law of the land, and could not be altered without a change in the Constitution. It was therefore as binding as any other law. But there had grown up in the North a moral and religious sentiment to which this constitutional requirement was utterly abhorrent. This sentiment often went so far as to refuse obedience to this provision of the Constitution. Webster not only did not share that feeling, but he believed that it was fraught with the gravest danger. He said plainly to the North as well as to the South that every provision of the Constitution must be carefully protected and enforced, including the clause providing for the extradition of fugitive slaves. He therefore was in favor of the enactment of a more perfect fugitive slave law.

No speech in the history of the country ever made so profound an impression. He seemed to have spoken to 30,000,000 of people. His utterances were generally approved by the South and by a considerable part of the North. By large numbers, however, they were received with sorrow, by many even with indignation. The flood-gates of vituperation and calumny were opened, and Webster was foully charged with most revolting vices for the purpose of breaking his influence. (See Swisshelm in *Independent*, Apr. 11, 1878, for curious evidence on this point.) The compromise measures, with some unimportant modifications, were passed, however, and secession, probably in consequence of their passage, was postponed to a time when the cause of the Union was relatively very much stronger and consequently very much more sure of success.

On the accession of President Fillmore, July 9, 1850, Webster was persuaded a second time to take the position of Secretary of State. During the next two years he conducted the foreign affairs of the Government with tact, dignity, and good judgment, but his health was rapidly failing, and in July, 1852, he expressed a desire to the President to resign. Mr. Fillmore, however, persuaded him to retain his office. As the presidential nomination of 1852 drew near his friends made a concerted movement in his behalf; but the effort only showed that in the course of his career, and especially during the last two years, he had aroused the earnest opposition of the strenuous abolitionists in all parts of the country. Gen. Scott was nominated by the Whigs, but as the Whigs were divided, and the Democrats were unanimously determined to resist all attempts to renew the slavery agitation, Webster advised his friends to vote for the Democratic candidate. In the course of the summer his health failed rapidly, and on Oct. 24, 1852, this mighty supporter and defender of the Union, whom history must ultimately recognize as one of the very greatest Americans, died at Marshfield as he was nearing the end of his seventy-first year.

AUTHORITIES.—The six volumes of the *Works of Daniel Webster* contain what he regarded as the most important of his speeches, and they are the most valuable of all sources of information concerning his views on many of the subjects on which he spoke; but a complete knowledge can not be obtained without frequent consultation of the records of Congress for speeches and utterances not contained in his collected works. Of biographical works, George Ticknor Curtis's *Life of Daniel Webster* (2 vols. 8vo) is the standard, and is by far the most important. Wilkinson's *Webster, an Ode* (1882), is important, and contains invaluable *Notes and Illustrations* in defense of Webster. Lodge's *Daniel Webster*, in the American Statesman Series, condemns vigorously the course of Webster in 1850. Of the formal histories of the period, those of Schouler, Rhodes, and Von Holst are of importance. The speeches of Clay and Calhoun must be read for an adequate view of the sectional feelings during the later period of Webster's life.

C. K. ADAMS.

Webster, JOHN: dramatist; b. in England toward the close of the sixteenth century; was associated with Dekker, Chettle, Drayton, Marston, Rowley, Middleton, Munday, Heywood, and Wentworth Smith in writing some of their plays, and ultimately became an author on his own account. Of his personal history nothing is known. Among his dramas are *The White Devil* or *Vittoria Corombona* (1612); *The Duchess of Malfy* (1623); *Appius and Virginia* (1624); and *The Devil's Law Case*. Webster's genius was exclusively tragic; his diction is sometimes Shakespearean, but he exaggerated the terrible into the horrible, and the morbid gloom and ferocity of his pictures of life are unrelieved by Shakespeare's sweetness, or by any humor. Webster's dramatic works have been edited by Dyce (4 vols., 1830) and by Hazlitt (4 vols., 1857–58). Revised by H. A. BEERS.

Webster, NOAH: lexicographer; b. at West Hartford, Conn., Oct. 16, 1758; graduated at Yale College 1778, serving in the Continental army during a part of his college course; studied law while teaching school at Hartford; was admitted to the bar 1781; taught a classical school at Goshen, Orange co., N. Y., 1782–83; prepared there his spelling-book, grammar, and reader, printed under the title *A Grammatical Institute of the English Language, etc., in Three Parts* (Hartford, 1783–85), a work so successful that the sale of the spelling-book has exceeded 60,000,000; printed an edition of Gov. Winthrop's *Journal*; wrote political articles for the Hartford *Courant* 1784; published *Sketches of American Policy* (1785), advocating the formation of a Federal Constitution: traveled in the Southern States the same year to petition their legislatures to favor a

copyright law; delivered a course of lectures on the English language in the principal Atlantic cities 1786; taught an academy in Philadelphia 1787, in which year he issued a pamphlet, *An Examination of the Leading Principles of the Federal Constitution*; edited in New York Dec., 1787, to Nov., 1788, the *American Magazine*, an unsuccessful enterprise; practiced law at Hartford 1789–93; married a daughter of William Greenleaf of Boston 1789; returned to New York and in Nov., 1793, founded a daily paper, the *Minerva*; published in his paper, over the signature of Curtius, an elaborate defense of Jay's treaty; settled in New Haven 1798; published *A Brief History of Epidemics* (2 vols., 1799); *Rights of Neutral Nations in Time of War* (1802); a *Compendious Dictionary of the English Language* (1806); and a *Philosophical and Practical Grammar of the English Language* (1807); devoted himself thenceforth to the great labor of his life, the preparation of the *American Dictionary of the English Language* (2 vols. 4to, 1828). He resided at Amherst, Mass., 1812–22; was influential in the establishment of Amherst College, and was president of its first board of trustees; returned to New Haven 1822; visited Europe 1824–25, pursuing his philological studies at the Bibliothèque du Roi, Paris, and completing his dictionary by the aid of the libraries of the University of Cambridge, and devoted his leisure for the remainder of his life to the revision of that work and of his schoolbooks, and to the preparation of a series of intermediate dictionaries. D. in New Haven, May 28, 1843. He had superintended in 1840 the publication of the 2d edition of his *Dictionary* (1840–41), carefully revised and with the addition of several thousand words. A 3d edition was edited by his son-in-law, Prof. Chauncey A. Goodrich, D. D. (1847), as also the 4th edition (pictorial, 1859), the latter containing 99,798 words. A 5th edition, with 114,000 words, 3,000 illustrations, and extensive revisions in every branch, but especially in etymology, was brought out in 1864 by Prof. Noah Porter, D. D., afterward president of Yale College. The latest revision is that of 1890 (*Webster's International*). Webster's minor publications are very numerous. See *Life of Noah Webster*, by Horace E. Scudder (Boston, 1882).

Revised by H. A. Beers.

Webster, Sir Richard Everard, Q. C.: jurist; b. in England, Dec. 22, 1842; educated at King's College and Charterhouse Schools and Trinity College, Cambridge; called to the bar 1868; queen's counsel 1878; acquired one of the largest and most valuable law practices in England; Attorney-General in Lord Salisbury's administration 1885–86, 1886–92, and 1895– ; in 1885 represented Launceston in Parliament; in the same year represented the Isle of Wight, and still represents that constituency. In 1893 he was one of the British representatives in the Bering Sea arbitration case.

Webster City: city (founded in 1854); capital of Hamilton co., Ia.; on the Boone river, and the Chi. and N. W., the Ill. Cent., and the Web. City and S. W. railways; 75 miles N. of Des Moines (for location, see map of Iowa, ref. 4–G). It is in an agricultural and coal-mining region, and has public and German Lutheran schools, several iron furnaces, shoe-factory, manufactory of temperance drinks, and a daily, a monthly, and 4 weekly periodicals. Pop. (1880) 1,848; (1890) 2,829; (1900) 4,613.

Editor of "Graphic-Herald."

Webster Groves: village; St. Louis co., Mo.; on the Mo. Pac. Railway; 10 miles S. W. of St. Louis (for location, see map of Missouri, ref. 4–J). It is the place of residence of many St. Louis business men, and has seven churches, public high school, separate district schools for white and colored children, private school for grammar and academic courses, and a kindergarten. Pop. (1890) 1,783; (1900) 1,895.

W. P. Hazard, secretary of board of education.

Wecker, Louis, de, M. D.: ophthalmologist; b. at Frankfort-on-the-Main, Sept. 29, 1832; studied medicine at Würzburg, Berlin, Paris, and Vienna, graduating M. D. at Würzburg in 1855 and at Paris in 1861. He had studied diseases of the eye under Arlt, von Graefe, Jaeger, Desmarres, and Sichel, and after 1862 he practiced his specialty in Paris. Among his more important works are *Traité des maladies des yeux* (Paris, 1863); *Traité des maladies du fond de l'œil* (Paris, 1870); *Thérapie oculaire* (Paris, 1878); *Chirurgie oculaire* (Paris, 1879); *Précis d'ophthalmoscopie clinique* (Paris, 1881); *Les Indications de l'extraction simple* (Paris, 1885); and with Landolt *Traité complet d'ophthalmologie* (Paris, 1883–84).

S. T. Armstrong.

Wedderburn, James: psalmodist; b. at Dundee, Scotland, about 1500; edited with his brother Robert *Ane Compendious Buike of Godly and Spirituall Sangs, collectit out of Sundrie Partes of the Scripture, wyth sundrie of nther Ballates changed out of Prophane Sangs, for avoyding of Sinne and Harlotrie* (printed at Edinburgh about 1548). This was the principal psalm-book used in Scotland. He was also the reputed author of *The Complaynt of Scotland* (1548), "the only classic work in old Scottish prose." D. in England about 1564.

Wedderburn, Sir William: See the Appendix.

Wedgwood, Josiah, F. R. S.: manufacturer of fine pottery; b. at Burslem, Staffordshire, England, July 12, 1730; was the younger son of a potter in easy circumstances, and descended from a family identified for several generations with the ceramic art; was apprenticed to his brother Thomas in 1744; worked at the potter's wheel several years; was lame from his sixteenth year as the result of a severe attack of smallpox; entered into business for himself with a partner named Harrison, at Stoke, in 1752, manufacturing the ordinary cheap wares then in demand, to which, however, his superintendence gave an artistic finish previously unknown; was from 1754 to 1759 partner of Thomas Wheildon, the most eminent potter of his day; devoted himself for many months to a careful study of, and experiments upon, the fictile materials then in use, resulting in the invention of a green "tortoise-shell" earthenware, having the smoothness and brilliant appearance of glass, from which he made toilet-vessels, services of dessert, knife-handles, and articles of *vertu*; established himself in business at his native place in 1759; perfected in 1761 a fine cream-colored ware, specimens of which, being presented to the queen, Charlotte of Mecklenburg, obtained him the title of queen's potter and permission to entitle his new art-product "queensware." He rapidly acquired a considerable fortune, of which he made a liberal use; married his cousin, Sarah Wedgwood, Jan. 25, 1764; was the most efficient promoter of Brindley's Grand Trunk Canal, to which he subscribed £1,000, and for which he cut the first sod at Burslem July 26, 1766; adapted the engine-lathe to the uses of his art; produced in 1766 his fine black "basaltes" or "Egyptian" ware, and shortly afterward his celebrated jasper ware; formed a partnership in 1768 with Thomas Bentley, of Liverpool, a man of fortune and artistic tastes; made experiments in the qualities of many kinds of clays, importing from the Cherokee district of South Carolina a fine porcelain clay; opened his celebrated establishment near Burslem which he named Etruria June 13, 1769; began about this time to produce copies of classical vases and other ancient masterpieces, chiefly from the engravings in Sir William Hamilton's *Antiquities*; opened in 1770, at Chelsea, a branch establishment for the painting and finishing of his wares; opened in London soon afterward a salesroom of his own, which became a fashionable resort of the nobility; received large orders from the Continent, especially from Catherine II. of Russia, for whom he executed a service of many hundreds of pieces, each representing a different English landscape; was elected to the Royal Society and to the Society of Antiquaries; invented the pyrometer; employed Flaxman and other great artists as his modelers; executed magnificent copies of the famous Barberini or Portland Vase 1790. He was highly esteemed by the royal family, enjoyed the intimate friendship of the Duke of Bridgwater, Earl Gower, and other prominent noblemen, and was regarded by his contemporaries as the father of his art in modern times. D. at Etruria, Jan. 3, 1795.—His sons John and Josiah, and their descendants, have continued his business to the present day. The naturalist Charles Darwin was the son of his daughter Susanna, and other descendants have been prominent in literature or science. His statue, by Davis, has been erected at Stoke-upon-Trent, and a memorial institute was opened at Burslem Oct. 26, 1863. His biography has been written by Llewellyn Jewett (1865) and by Miss Eliza Meteyard (2 vols., 1865–66), who is also author of *Memorials of Wedgwood* (1875) and *Wedgwood Handbook* (1875). See Pottery and Porcelain.

Revised by Russell Sturgis.

Wedgwood Ware: See Pottery and Porcelain.

Wedlock: See Marriage.

Wednesbury, wenz'bŭr-rĕē: town of England; in Staffordshire, near the sources of the Tame; 8 miles N. W. of Birmingham (see map of England, ref. 9–G). It is in the center-

of a rich iron and coal district, and has extensive manufactures of ironware of almost every description. The Perpendicular church of St. Bartholomew is built on the site of a temple of Woden, whence the Old English name Wodnesbeah. Pop. of the parliamentary borough, returning one member (1891), 69,083.

Wednesday [M. Eng. *wednesdai*, *wodnesdai* < O. Eng. *Wōdnes dæg*, Woden's day (used as translation of Lat. *Mercu'rii dies*, Wednesday, liter., Mercury's day)]: the fourth day of the week; so named in consequence of an identification of the Northern god Woden or Odin with the Roman Mercurius. By the old superstition Wednesday was considered not particularly lucky nor particularly dangerous.

Weed, Stephen Hinsdale: soldier; b. in New York in 1834; graduated at the New York Free Academy 1850, and at the U. S. Military Academy July, 1854, when commissioned brevet second lieutenant of artillery; promoted first lieutenant 1856; served on the Texan frontier and in the Florida war 1855–57, and the Utah expedition 1858–61. Promoted captain in the Fifth Artillery May 14, 1861, he was engaged at regimental headquarters and on recruiting duty from August to November, and at Camp Greble, Pa., Nov., 1861, to Mar., 1862, when, joining the Army of the Potomac, he commanded his battery throughout the Peninsular campaign of 1862, and at Manassas, Antietam, and Chancellorsville, in all of which battles he displayed great bravery. After Chancellorsville he was given command of the artillery brigade, Fifth Corps, and June 6 was appointed a brigadier-general of volunteers. At Gettysburg he commanded a brigade of artillery, Fifth Corps, and in the terrible struggle of July 2, 1863, for the possession of Little Round Top, he was instantly killed at the head of his command, on the spot now marked "Weed's Hill." Revised by James Mercur.

Weed, Thurlow: journalist and party leader; b. at Cairo, Greene co., N. Y., Nov. 15, 1797; was cabin-boy on a Hudson river vessel when ten years of age; entered a printing-office at Catskill two years later; worked in several villages in the interior of New York; was a volunteer on the northern frontier of New York in the war of 1812–15, serving as quartermaster-sergeant; established in 1818 *The Agriculturist* at Norwich, Chenango co., N. Y.; edited several other papers during the ensuing ten years, among which was *The Anti-Masonic Enquirer* at Rochester 1826–27. He was twice elected to the New York Assembly 1826–30; contributed largely to the election of De Witt Clinton as Governor 1826; settled at Albany in 1830; founded there *The Evening Journal*, a newspaper established in the interests of the party then being formed in opposition equally to the administration of President Jackson, as represented by the "Albany Regency," and to the nullification policy of Calhoun; was an original leader of the Whig party; contributed largely to the election of Gov. Seward in 1838 and 1840, to the nomination of Harrison in 1836 and 1840, and to his election on the latter occasion; became known as the most adroit of party managers, but declined to accept any public office; was active in promoting the nomination of Gen. Taylor in 1848 and of Gen. Scott in 1852; exerted his influence in 1856 and 1860 in favor of the nomination of William H. Seward, but rendered cordial support to Frémont and Lincoln; was an advocate of the energetic prosecution of the war 1861–65; visited Europe at the request of President Lincoln Nov., 1861, remaining abroad until June, 1862, and exerted an important influence upon English opinion through his personal relations with leading statesmen; withdrew from *The Evening Journal* in 1862; settled in New York city 1865, and was editor of *The Commercial Advertiser* 1867–68, after which he retired from active journalism, but continued throughout the administration of President Grant, and especially during the grave constitutional crisis ensuing upon the election of 1876, to exert a powerful influence upon the counsels of his party, and was a frequent contributor over his own signature to the columns of the political journals. He published *Letters from Europe and the West Indies* (Albany, 1866), and some interesting *Reminiscences* in the *Atlantic Monthly* (1870) and in other periodicals, and prepared an autobiography which was edited by his daughter and published in 1882. D. in New York, Nov. 22, 1882. Revised by F. M. Colby.

Weeden, William Babcock, A. M.: soldier and author; b. at Bristol, R. I., Sept. 1, 1834; son of John E. Weeden, M. D.; educated at Brown University; became a manufacturer of woolen goods at Providence; in 1861 became second lieutenant in the first battery; enlisted in Rhode Island for three years' service in the Union army; was promoted captain; chief of artillery of division commanded by Brig.-Gen. Morell; was engaged at the siege of Yorktown, and in the battles of Hanover Court-house, Mechanicsville, Gaines's Mill, and Malvern Hill; resigned in Aug., 1862, and returned to business life; author of *Morality of Prohibitory Liquor Laws* (Boston, 1875); *Social Law of Labor* (Boston, 1882); *Economic and Social History of New England 1620–1789* (2 vols., Boston, 1890).

Weedsport: village; Cayuga co., N. Y.: on the Erie Canal, and the Lehigh Val., the N. Y. Cent. and Hud. Riv., and the W. Shore railways; 9 miles N. of Auburn, 22 miles W. of Syracuse (for location, see map of New York, ref. 4–F). It is in an agricultural region, and has 5 churches, Union public school, 2 private banks, 3 weekly newspapers, corset and casket factories, and agricultural-implement works. It is an important coal-shipping point. Pop. (1880) 1,411; (1890) 1,580; (1900) 1,525. Editor of "Sentinel."

Wee'hawken: township; Hudson co., N. J.; on the Hudson river, and the N. Y., Ont. and West. and the West Shore railways (for location, see map of New Jersey, ref. 2–E). It has 2 churches, a public and a Roman Catholic school, 2 reservoirs of the Hackensack Water Company (reorganized) with capacity of 15,176,000 and 29,760,000 gal. respectively, a high service-tower with capacity of 150,000 gal., a regulating-tank with capacity of 383,000 gal., and a lard-refinery. Weehawken is probably the largest coal depôt in the U. S., having the coal docks of the Pennsylvania Coal Company, the Delaware and Hudson Canal Company, and the Erie Railroad Company, and also the freight sheds of the last. It is also noted as the Hamilton-Burr dueling-ground. Pop. (1880) 1,102; (1890) 1,943; (1900) 5,325. George E. Reynolds, surveyor.

Week [O. Eng. *weocu*, *wicu*, *wucu*: O. H. Germ. *wohha* (*wehha*) > Mod. Germ. *woche*: Icel. *vika*: Goth. *wikō*]: a period of seven days, forming a subdivision of the lunar month, corresponding to the four quarters of the moon, or about 7⅜ days. It was in common use among the ancient Hebrews, who, in Ex. xx. 11, referred its origin to the creation of the world, and in Deut. v. 15 to the exodus from Egypt. It was not a Hebrew invention, however, as may be seen from Josephus, Philo Judæus, Clemens of Alexandria, and others. It was found as a civil institution in the very earliest times among the Hindus, Persians, Assyrians, and Egyptians. But the Jews were the only nation with which the week had a religious signification. With the Egyptians, Assyrians, etc., the seventh day was simply a day of recreation; with the Jews it was the day of worship, the Sabbath. The Greeks divided the month into three periods of ten days (*decades*), and the Romans gathered the days into periods of eight days (*nundinæ*); with both, the first day of the period was the market-day, on which country people came to town and stirred up both business and public life. The period of seven days, the week proper, was introduced to the Romans and Greeks partly by Christianity (which may be inferred from the fact that the term *sabbath* was adopted), partly by the Egyptian astronomy and astrology. Among the Jews the days of the week had no names; they were simply counted. The Egyptians, however, named them after the seven planets then known, and in the following way: they arranged the planets according to their distance from the earth, beginning with the most distant; ascribed a planet to each hour, and named the day after the planet which reigned over its first hour. This method of appellation was adopted by the Romans, so that when Saturn presided over the first hour of the first day, which consequently became *Saturday*, the first hour of the second day would fall to the sun, etc.

Weekes, Henry, R. A.: sculptor; b. at Canterbury, England, in 1807; studied sculpture under Behnes and at the Royal Academy, where he entered 1823; was many years the principal assistant of Chantrey, whom he succeeded in his studio at Pimlico 1841; was elected to the Academy 1863, and became Professor of Sculpture there May 16, 1873. He executed the first bust of Queen Victoria (1837), statues of Cranmer, Latimer, Ridley, Wellesley, Bacon, Hunter, Harvey, Charles II., and many others, and gained a gold medal for the best treatise on the fine-art section of the Great Exhibition of 1851. D. May 29, 1877.

Weeks, Edwin Lord: genre-painter; b. in Boston, Mass., in 1849; pupil of Bonnat and Gérôme, Paris; honorable mention Paris Salon, 1884; third-class medal 1889; first-class medal Paris Exposition, 1889. He paints principally scenes

in India and other Eastern countries. *The Last Voyage—Souvenir of the Ganges* and *A Rajah of Jodhpore* are two of his most important works. His studio is in Paris.

WILLIAM A. COFFIN.

Weeks, Feast of: See PENTECOST.

Weenix, JAN, the younger: painter; b. at Amsterdam, Holland, in 1640; pupil of his father, Jan Baptist Weenix. Although the son was only twenty when his father died, he had already so completely learned the latter's method that it is often impossible to decide whether it was the father or the son who painted the picture. He painted figures, animals, birds, landscapes, ruins, fruit, flowers, and portraits, but he is most famous for his hunting scenes and dead game. His coloring surpassed his father's. Weenix was at Utrecht between 1664 to 1668, and at Bensburg near Cologne from 1702 till 1712 in the employment of the Elector of the Palatinate. D. at Amsterdam, Sept. 20, 1719. England possesses many works by this master. He is well represented also in Berlin, Dresden, Munich, Paris, Petersburg, and The Hague. W. J. S.

Weenix, JAN BAPTIST: painter; b. at Amsterdam, Holland, in 1621. He studied under Micker, Bloemart, and N. Moijart, after which he went to Italy and lived in Rome 1642–46. He returned to his native city, where he remained till 1649, when he went to Utrecht; painted there till 1657. The remaining years of his life he spent at the Château de Ter Mey in the neighborhood. D. near Utrecht, Oct. 31, 1660. Pictures bearing a later date may be attributed to his son and pupil, Jan Weenix. J. B. Weenix painted landscapes with figures, pictures of the seacoast, Italian ruins, scenes of everyday life, dead game, etc. He rarely attempted poetical or historical subjects. W. J. S.

Weeping: the act of shedding tears, accompanied, especially in children, by facial distortion and involuntary muscular contractions in other parts of the body. For the purpose of secreting and conducting the tears there is a special apparatus placed within the orbit at itsupper part, consisting of a body called the lachrymal gland; of a reservoir, the lachrymal sac; of certain canals which collect the tears from the inner angle and convey them to the lachrymal sac; and of a tube, the lachrymal duct, by which the secretion is carried from the sac into the nose. Aside from the office of the tears in expressing certain emotions, they serve to lubricate and keep moist the lining membrane of the eyelids and external coat of the eyeball, the conjunctiva. The secretion of tears, whether for emotional or ordinary physiological purposes, is effected through the intermediation of the fifth pair of the cranial nerves and the sympathetic nerves.

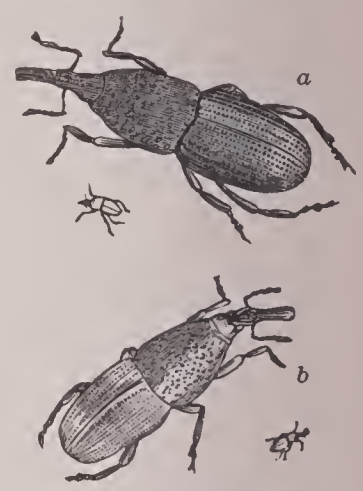
Sobbing, which is a species of weeping, appears to result in part from the attempt to restrain the emotions, and from a cause analogous to that which induces sighing—namely, the demand of the system for additional aëration of the blood—a process which intense emotion serves to disturb.

Weeping Water: city; Cass co., Neb.; on the Weeping Water river, and the Mo. Pac. Railway; 30 miles E. of Lincoln, 41 miles S. by W. of Omaha (for location, see map of Nebraska, ref. 10–H). It is in an agricultural, lime-burning, and stock-trading region, contains Weeping Water Academy (Congregational), public high school, and a national bank with capital of $50,000, and has a weekly newspaper. Pop. (1880) 317; (1890) 1,350; (1900) 1,156.

Weever: See TRACHINIDÆ and also GREAT WEEVER.

Weevil [M. Eng. *wivel* < O. Eng. *wifel*: O. H. Germ. *wibil* > Mod. Germ. *wiebel*; cf. Lith. *vabalas*, beetle, probably connected with the word *to weave*]: a name properly applied to many snout-beetles (*Curculionidæ*), but more particularly to the insects belonging to the genus *Bruchus*, formerly included among the *Rhynchophora*, but now placed in a family (*Bruchidæ*) which connects the snout-beetles with the leaf-beetles (*Chrysomelidæ*), and has greatest affinities with these last. The snout-beetles are characterized by the extension of the head into a snout or proboscis, at the tip of which the jaws are placed. By means of this snout the eggs are inserted where the larvæ are destined to live. The larvæ are, with few exceptions, footless, clumsy grubs, with a horny head, and live within the blossoms, fruits, seeds, stems, or roots of plants. Some few even live within leaves. There are over 400 described North American species of the *Curculionidæ* proper. The following are among the more notable in their larval habits: *Conotrachelus nenuphar*, the plum-weevil (see CURCULIO), works, as larva, in the flesh of stone fruit, and transforms in the ground; *C. cratægi* infests the pear and quince; *Anthonomus prunicida* works in the stones of plums, and transforms therein; *A. quadrigibbus* works in apples and other pip fruit; *Cœliodes inæqualis* works in grapes; *Analcis fragariæ* injures the crown and root of the strawberry; *Baridius trinotatus* bores the stems of the potato; *Ithycerus novæboracensis* breeds in the twigs of oaks; *Pissodes strobi* burrows in the tips of pines; *Hylobius pales* in the stems and roots of *Pinus sylvestris*; *Magdalis armicollis* works under the bark of elms; *Dorytomus mucidus* breeds in the blossoms of cottonwoods and willows. *Balaninus* comprises species with very long snouts, and known as "nut-weevils," different species infesting different nuts, as *caryæ*, hickory nuts; *sayi*, chestnuts; *uniformis* and *quercus*, acorns. *Rhynchophorus zimmermanni*, the largest species, breeds in the palmetto palm.

Though the term weevil, when used alone, is often very loosely and incorrectly applied by farmers to several insects that affect wheat, and particularly to the wheat-midge (*Cecidomyia tritici*)—a little orange, dipterous maggot that affects the growing ear—it strictly belongs to the grain-weevil (*Calandra granaria*), which is the greatest pest to stored grain, and frequently reduces a lot of wheat to mere husks before its presence is noticed. The beetle is about one-eighth of an inch long, of a deep chestnut-brown color, with nine deeply punctured striæ along each elytron, and without wings. The female with her snout makes an oblique puncture just under the skin of the stored grain, and lays an egg therein, from which egg there hatches a whitish grub that devours the substance of the kernel and undergoes its transformations within the hull. In from forty to fifty days from hatching the perfect weevil eats its way out. Several generations are produced each year, and when once the insect is established it increases at an alarming rate, more particularly in warm climates. There is a closely allied form, known as the rice-weevil (*Calandra oryzæ*). The habits of the two are similar. Both infest most kinds of dry grain, including maize, and both are widespread over the world. The remedies used against weevils are principally kiln-drying, sulphur fumes, and sprinkling of air-slaked lime among the grain. The best antidote is cleanliness. All rubbish that can harbor weevils should be burned, cracks filled up, the walls whitewashed, and a general supervision had over the grain, which should be kept as cool as possible, and well aired.



a, *Calandra granaria*; *b*, *C. oryzæ*. (The small outlines show the natural size.)

The *Bruchidæ*, or weevils proper, mostly breed in the seeds of leguminous plants; their larvæ are fat, clumsy, wrinkled grubs, and in some instances are provided with short legs. Their eggs are glued to the outside of the pod. The new-born larva eats directly through the pod and into the seed, the hole of entrance closing up if the pod is yet green. The pea-weevil (*Bruchus pisi*) affects peas, one individual appropriating the contents of one pea; the eggs are laid while the pod is forming. The bean-weevil (*Bruchus fabæ*) infests beans, several individuals developing in the same bean. Revised by J. S. KINGSLEY.

Wehrlite: See PERIDOTITE.

Weidner, REVERE FRANKLIN, D. D., LL. D.: theologian; b. at Centre Valley, Lehigh co., Pa., Nov. 22, 1851; graduated at Muhlenberg College 1869, and Philadelphia Seminary 1873; pastor at Phillipsburg, N. J., 1873–78, and Philadelphia 1878–82; Professor of Dogmatics and Exegesis, Augustana Theological Seminary, Rock Island, Ill., 1882–91. Since 1891 he has been chairman of the faculty of the Lutheran Theological Seminary at Chicago, Ill. He is a voluminous author in almost all departments of theology. His works include *Theological Encyclopædia*, *Studies in the Book*, *Introduction to Dogmatic Theology*, *Introductory New Testament Greek Method*, *System of Christian Ethics*, *Commentary on Mark*, etc. HENRY E. JACOBS.

Weige'la [Mod. Lat., named from C. E. Weigel, a German naturalist]: a shrub found in China by the celebrated nat-

uralist Dr. Robert Fortune, by whom it was introduced into England and named *W. rosea*, but afterward found to be identical with *Diervilla*, a genus introduced into Europe from Canada in the eighteenth century. Its proper name is *D. florida*; other commonly cultivated species are *D. japonica*, *D. grandiflora*, and *D. floribunda*. In the U. S., where there are two indigenous species, it is known as "bush honeysuckle." C. E. BESSEY.

Weighing-machines: machines or contrivances used to ascertain the heaviness of bodies.

Weight is the result of the attraction of gravitation upon a body, and as the force of gravity is not the same at different parts of the earth's surface, so the weight of any piece or body, if by weight we mean the effect of gravity upon it, differs according to the place at which it is weighed. Thus a mass of iron which weighs 1,000 lb. at the equator would weigh 1,005 lb. at the pole; 500 lb. at a point 2,000 miles below the surface or 1,650 miles above it; 2,600 lb. on the surface of Jupiter, and 28,000 lb. on the surface of the sun. As ordinarily used, however, weight does not mean the absolute heaviness of a body or the effect of gravity upon it, but the relative heaviness—that is, its heaviness as compared with that of a certain piece of metal which is taken as a standard, and weighed at the same place and under the same conditions. For the standards of weight—the pound and the kilogramme—see WEIGHTS AND MEASURES.

For the comparison of standard weights with each other, for governmental and scientific purposes, instruments of the utmost possible refinement, such as chemical balances, are required, so as to make the error of ascertainment of their relative weights as small as possible. For commercial purposes such refinement is not attempted, but it is desirable that the error of weighing be so small that it can create no dissatisfaction in the mind of either buyer or seller, or user of the weights for any purpose. In chemical analysis, the largest allowable error must be less than the limit of accuracy of the process used by the chemist, say, $\frac{1}{1000}$th of 1 per cent.

The mechanical principles upon which weighing-machines are based are various, but in general they all have one idea in common, that of opposing to the force of gravitation, which acts upon the body to be weighed, some resistance the amount of which can be determined and expressed in weights of the accepted standard. The several mechanical principles which have been adopted or proposed for weighing-machines are enumerated below, with examples of their application.

1. *The Elasticity of Metal or other Substances.*—An illustration of this principle is seen in the simple weighing-machine shown in Fig. 1, consisting of a flexible steel strip, *a*, rigidly fastened at one end to a firm pedestal, *b*, and carrying at its outer end a pan, *c*. A 1-lb. weight placed in the pan, *c*, will bring the pointer down to the mark 1 on the graduated standard, 2 lb. brings it down to the mark 2, and so on. By finely graduating the index-plate, and by reading carefully the position of the pointer upon it after it ceases vibrating, a fairly accurate weighing-machine for a limited range of purposes is obtained.

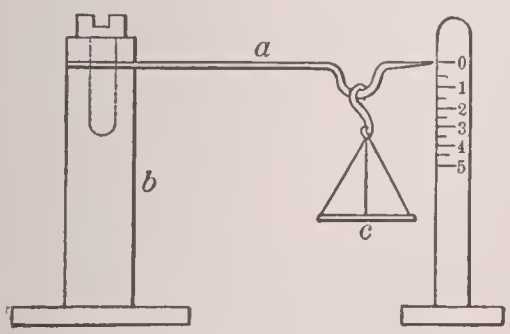


FIG. 1.—Elementary weighing device.

Weighing on this machine is done by the method known as "weighing by substitution," which consists in substituting for the substance on the scale-pan, whose weight is to be determined, standard weights sufficient to produce exactly the same effect on the scale. The sum of the standard weights so used is the weight of the substance. This method of substitution is employed in the very finest weighing for scientific purposes, because it avoids many of the errors common to the ordinary methods of balancing a weight on one side of a scale-beam against a weight on the other.

Another form of machine, using the flexibility of this same metal strip, might be made by fastening or supporting the strip at each end and noting the deflection of the middle point. A railway bridge might thus be used as a weighing-machine to weigh the trains that cross it; the heavier the train, the greater being the deflection.

The most common illustration of the use of the principle of the elasticity of metals is seen in the ordinary spring-balance, which consists simply of a spirally wound wire which is held at one end, the weight to be weighed being suspended from a hook at the other. These wire coils may be used either in compression or in extension. The common form of balance with a pointer rotating on a dial is just the same with the addition of a small rack and pinion to give the rotary motion.

Instead of the elasticity of metal we may use that of other substances, such as cork, India-rubber, or even air. Suppose a blacksmith's bellows, perfectly free from leaks and with its outlet closed. Place a pound weight on the upper plate of the bellows and it will be depressed slightly. Two pounds will depress it twice as much or nearly so. Thus an index scale of depressions corresponding to certain weights might be constructed and the bellows thus become a weighing-machine.

The common gas-holder of the gas-works may be used as a weighing-machine. It consists of an inner tank inverted in an outside tank which is filled with water. Gas is introduced into the inner tank, raising it to a certain height. Weights are now placed on the top of the inner tank, depressing it in proportion to the amount of weight. The amount of the depression recording the pressure to which the contained gas is subjected is also a record of the weight applied.

2. *The Buoyancy of Liquids.*—The common hydrometer used for determining the density of liquids (Fig. 2) illustrates this principle. It may also be used to determine the weight of small bodies by the method of substitution, since equal weights placed in the pan at the top depress the instrument the same distance. On the same principle a boat or any vessel floating in water may be used as a weighing-machine. When the vessel is unloaded, the water-line is at a certain mark. As the vessel is loaded, it sinks deeper and deeper in the water, and successive marks, showing the amount of water the vessel is drawing, also measure the weight of the cargo placed on board.

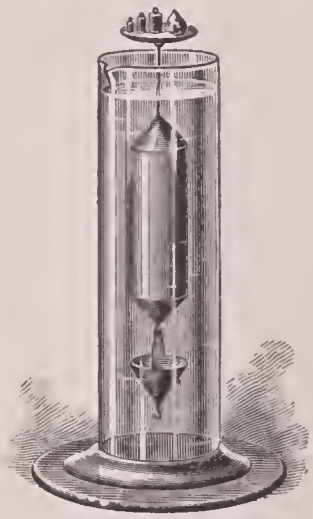


FIG. 2.—Hydrometer.

3. *The Chain-balance.*—What is called the chain-balance is described in various works, but it is rarely if ever used in practice. It consists simply of two upright posts, *c d*, Fig. 3, between which is loosely stretched a cord or chain, *a b*. To two points in this chain are attached the scale-pans, *e f*. When the scale-pans are unloaded, the chain will take a definite position, depending upon the position of the points of attachment of the scale-pans. If the pan *f* be loaded, that pan will take a lower position, while the other one will rise, the chain changing to the position shown by the dotted line *a' b'*. If an equal load be placed in the other pan, the chain will return to its original position.

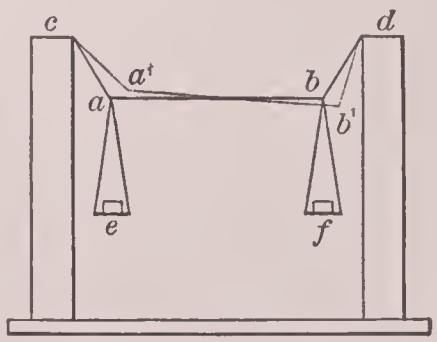


FIG. 3.—Chain-balance.

4. *The Pendulum or Bent-lever Balance.*—This is a balance which has had rather limited application hitherto, the most common form being a cheap and not very accurate letter balance, for weighing a few ounces. It consists in its

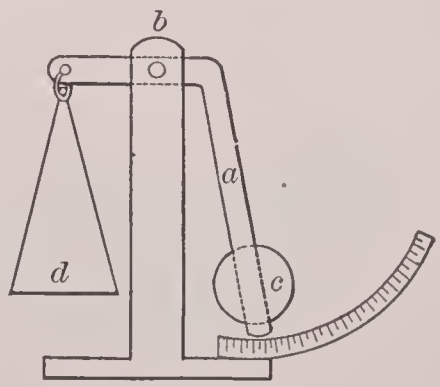


FIG. 4.—Bent-lever balance.

simplest form of a bent arm, *a*, Fig. 4, carrying at the end of the vertical portion a weight, *c*, and at the end of the horizontal portion the scale-pan, *d*, suspended from a pivot, *b*. It is evident that as weights are placed in the scale-pan they will cause the weight, *c*, to move outward from the supporting pillar until the leverage of the arm and weight on one side of the pillar counterbalances the effect of the weight in the scale-pan. The balance may be made a standard by marking on the graduated index the position at which the arm comes to rest under the application of successive weights.

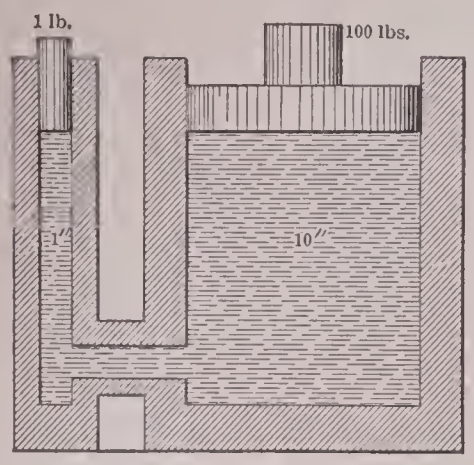


Fig. 5.—Hydrostatic balance.

5. *The Hydrostatic Balance.*—The most elementary form of this balance is shown in Fig. 5. It is based on the principle of the hydrostatic press or common hydraulic jack. There are two communicating cylinders, one very much larger than the other, each fitted with a piston. Leakage and friction being left out of the account, a weight placed on the piston of the smaller cylinder will balance a weight on the piston of the larger cylinder which is as many times greater as the area of the larger piston is greater than that of the smaller. By substituting for the pistons flexible metallic diaphragms, the objections of leakage and piston friction are avoided, and upon this principle is constructed the hydraulic weighing apparatus used in the Emery testing-machine.

6. *The Even Balance.*—Weighing-machines based on the principles already referred to are of quite restricted application. The simplest, most ancient, and most universally used form of weighing-machine is the even balance, a crude form of which is shown in Fig. 6. It consists of a rigid beam of metal, with three pivots, or "knife-edges," firmly inserted in it, so that their edges are in the same plane, and the end pivots exactly equidistant from the central pivot. The central knife-edge rests on a horizontal plate fastened in the upright support, and a bifurcated hanger rests on each of the end knife-edges, carrying the weighing-pans beneath. The principles of this balance are more fully described in the article Balance. The pivots and central plate, and also the portions of the hangers which rest on the end pivot, are usually made of hardened steel, but in some fine chemical balances agate knife-edges and plates are used.

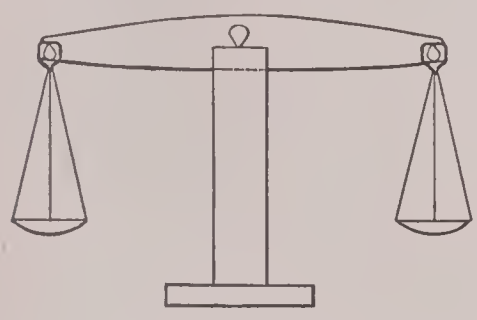


Fig. 6.—Even balance.

7. *The Lever or Steelyard Balance.*—The even balance has one serious objection as a weighing-machine for heavy weights, viz.: the necessity of placing weights in one pan of the balance equal to the weight of the substance which is being weighed in the other. For weights up to 10 or 20 lb. this is no great inconvenience, but when we wish to weigh hundreds or thousands of pounds it becomes intolerable. This led to the adoption in very early times of the lever balance or, as it is sometimes called, the Roman steelyard, which is illustrated in the weighmaster's scale, Fig. 7. The principle upon which this balance is based is that of the lever, namely, that a heavy weight suspended from the end of the short arm of the lever may be balanced by a smaller weight suspended from the end of the long arm, the weights being inversely proportional to the lengths of the arms, or the product of the heavier weight multiplied by the length of the short arm being equal to the product of the lighter weight multiplied by the length of the long arm. In practice the steelyard balance does not generally have a pan support or weight-holder attached to each end of the balance, but only to the short end, while on the long arm there is a movable weight, which may be placed at any position required to balance the weight suspended from the short arm. Marks and nicks are placed upon the beam to indicate the positions at which the movable weight should be placed to counterbalance certain definite weights suspended from the short arm.

Fig. 7.—Weighmaster's steelyard scale.

8. *The Compound Lever Balance.*—This is merely an extension of the principle of the steelyard, by using two or more steelyards linked together as shown in the sketch, Fig. 8. If a weight of 100 lb. is suspended from the short arm of a beam whose arms are to each other as 10 to 1, a force of 10 lb. applied at the end of the long arm will balance it, but this force may be applied by means of a second lever. If this second lever also has a ratio of lengths of arms of 10 to 1, 1 lb. applied at the end of the long arm of the second lever will balance 100 lb. at the end of the short arm of the first lever, the weights of the levers of course being first counterbalanced so as to remain in balance when unloaded. One form of a compound lever scale is shown in the Boston market scale, Fig. 9. The pan which holds the article to be weighed, instead of being attached directly to the short arm of the lever, is connected by a secondary lever, an adjustable counterpoise being arranged to balance the weight of the beam or long arm of the lever.

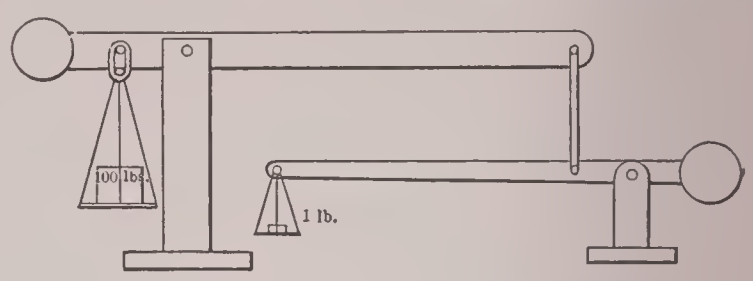


Fig. 8.—Compound lever balance.

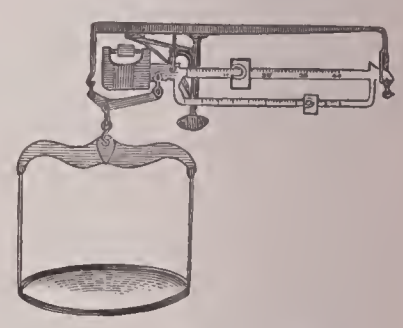


Fig. 9.—Boston market scale.

9. *Scales with Pans supported above the Beam.*—The even balances and lever balances heretofore discussed all have scale-pans suspended from the beams, but for many purposes suspended scale-pans are inconvenient and pans supported above the beam are desired. In order to make a successful upright-pan balance it is necessary to allow the pan supports to move on the end of pivots and at the same time to insure that they remain in a vertical position, no matter what deviation from the horizontal the beam may take in its oscillation. This is accomplished by adding to the structure a parallel motion, shown in the sketch, Fig. 10, placing a second beam, more slender than the first, underneath the latter, and pinning each pan support near its lower end to this lower beam by a pin, so that while both beams oscillate together the pan supports, slightly rotating on the pins, preserve a parallel and vertical position. If a pound weight be placed on each pan, the scale will balance, and if either weight be moved to any side or corner of the pan it will still balance, eccentricity of loading having no effect to disturb the equilibrium. This is the principle of all upright-pan pivot

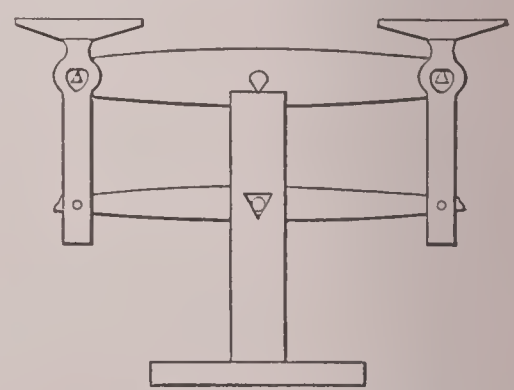


Fig. 10.—Model of upright-pan scale.

balances. In ordinary knife-edge upright-pan scales, such as the one shown in Fig. 11, an ordinary grocer's counter scale, the lower beam is hidden in the casting, close to the table. The lower beam is sometimes made in two parts, being cut in half in the middle of its length, each half being separately pivoted to the central support. Each half of the lower beam is then called a radius arm. The balance shown in Fig. 11 is provided at one end with a pan for holding the article to be weighed and at the other with a plate for holding the various weights. Such balances sometimes have besides the weight a graduated side beam attached to the lever or principal beam, with a movable poise upon this side beam.

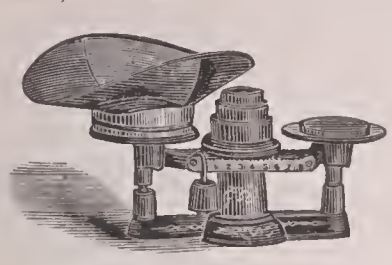


Fig. 11.—Even balance with side beam.

10. *The Platform Scale.*—To obtain an elementary idea of the principle of the platform scale, let the reader refer back to Fig. 8 and imagine four equal steelyard levers like the one at the left of the cut, which carries 100 lb., so disposed at the corners of a rectangle that the ends of their longer arms nearly touch each other, and a double bifurcated hanger extending from the pivots at these ends downward to the central pivot of the lever of the third order shown at the right of the cut. The relative lengths of all the levers remaining as before, 10 to 1, it is evident that 4 lb. placed in the small pan of the lower lever will balance 400 lb.—that is, 100 lb. on each of the four primary levers. Now substitute for the 400 lb. and the pans a rectangular platform placed above the four levers, and provided with

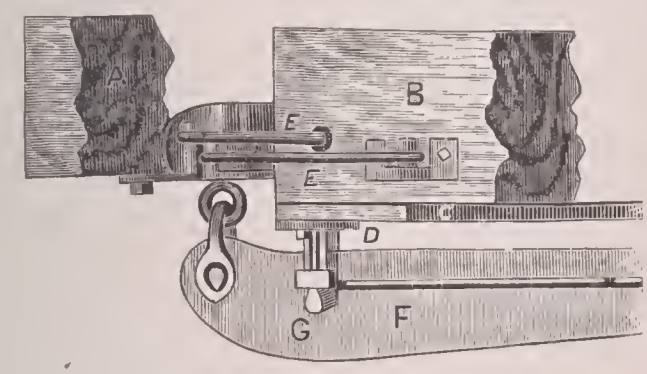


Fig. 12.—Fairbanks platform bearing.

four short feet which rest in the links hanging on the pivots of the short arms of the four levers, and load this platform so that the total load including the platform equals the weights of the pans and 400 lb.; it is then evident that the machine thus constructed will be in equilibrium when 4 lb. are in the pan at the extremity of the lower lever. The upward force of 4 lb. acting at the outer pivot, instead of being thus counterbalanced, may be carried by a system of levers and links to any point at which it may be more convenient to counterbalance it by a weight in a pan, or by a weight sliding on a graduated beam. This is the general principle of all platform scales. In practice, the means of transmitting the weight of the platform and its load to the primary levers, and the form of the links, levers, etc., required for carrying the several forces developed to the point where the weight is to be registered, vary considerably. One of the methods of supporting the load on the primary lever, used in the Fairbanks scale, invented by Thaddeus Fairbanks, of Vermont, patented June 13, 1831, is shown in Fig. 12. Each lever, F, is provided at its extremity with knife-edged bearings placed in a stirrup depending from the fixed frame timber, A, surrounding the pit in which the platform and its adjuncts are arranged. At a suitable distance from the just-mentioned extremity of the lever are knife-edged bearings, G; an iron casting, D, extends downward from the platform, B, and, passing astride of the lever, F, rests on the knife-edges, G, at each side of the lever.

If, now, the load to be weighed could be dropped vertically upon the platform, B, this arrangement would be sufficient; but in practice the load is drawn in wagons or cars, as the case may be, upon the platform, and on striking the edge of the latter gives it a positive lateral movement which tends to make the casting, D, scrape upon the knife-edges, G; and this dulls the knife-edges and impairs the accuracy of the apparatus. In order to prevent this lateral movement of the platform, B, check-rods, E, are extended from the fixed frame timber, A, to the platform, with the object of resisting the lateral strain. In the Howe scale the check-rods are dispensed with, and freedom secured to the platform without involving the frictional movement or scraping of the casting, D, upon the knife-edge. This is done, as shown in the figures of Howe's platform bearing (Fig. 13) and railroad scale (Fig. 14), by making the main levers, A, of elbow shape, their upper ends connecting by rods, C, with the center levers, E, from which, through a supplemental lever, F, and rods, G, motion is communicated to the beam. The lower ends of the elbow levers, A (the form of which is shown in the larger view), have knife-edges resting on chilled iron blocks, these knife-edges forming the fulcrums of the said levers. The short arms of these levers have knife-edges, which receive the bearings of the casting, N. In the upper side of the casting, N, are two shallow cup-shaped recesses which receive the balls or spheres, K, and on these rest the cupped bearings, B, fastened to the timber of the platform. The center levers, E, of course, work on knife-edges. When the load strikes the edge of the platform the movement of the latter simply causes it to sway slightly on the spheres, and this is immediately corrected by the gravity of the platform itself.

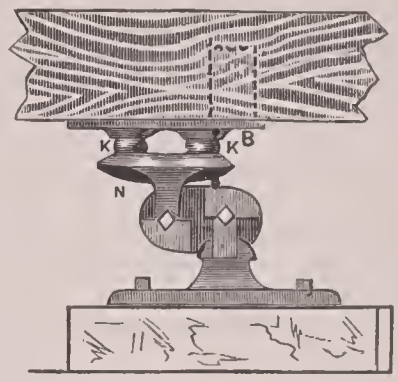


Fig. 13.—Howe platform bearing.

11. *The Flexure-pivot Balance.*—For over 2,000 years the knife-edge has been practically the only form of pivot used in even balances and steelyards, round pivots being rarely, if ever, used, on account of their excessive friction. The knife-edge itself, however, is open to objections from its lack of permanency, being susceptible to injury from bruising, crushing, and corrosion. The plates on which the pivots act are also subject to grooving, and the bearing-points of the plates on the hanging links suspended from the end pivots also are apt to change their position relative to the knife-edge, so that slight inaccuracy is thus introduced in the weighing. These objections have been overcome by two kinds of fixed pivots, the flexure pivot and the torsion pivot. The flexure pivot is simply a thin plate of steel, one end of which is clamped to the beam, and the other to the fixed support, as shown in the sketch, Fig. 15. An oscillation of the beam causes a slight flexure of the steel plate. Balances on this principle were patented by J. M. Taurines, of Paris, in 1861, and by F. D. Artingstall, of Manchester, England, in 1862, but they have not come into commercial use.

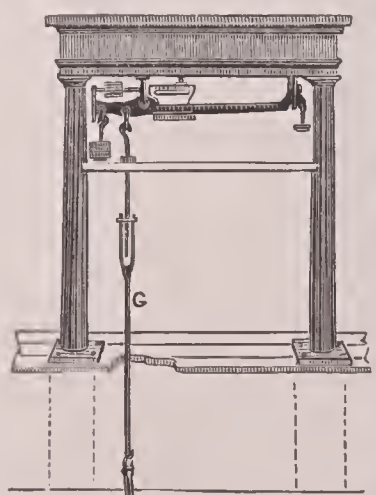


Fig. 14.—Howe railroad scale.

In 1872, and also in 1883 and 1884, A. H. Emery obtained

U. S. patents on weighing-machines in which are combined the principles of the flexure-pivoted beam and the hydrostatic balance with flexible metallic diaphragms which has already been referred to. In 1879 he completed, at a cost of over $100,000, his famous testing-machine on this combination of principles, which has since that date been in the service of the U. S. Government at the arsenal at Watertown, Mass. It is used for testing the strength of metals and other materials of construction, and has a capacity of 800,000 lb., for strains of either tension or compression, and can test specimens of any length up to 30 feet.

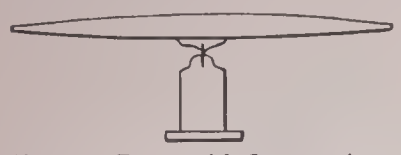


Fig. 15.—Beam with flexure pivot.

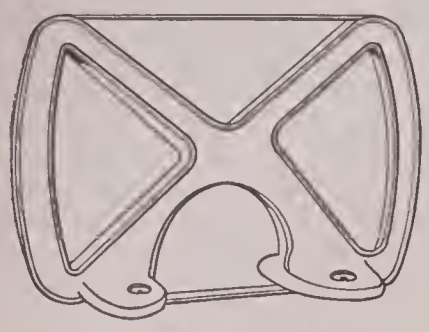


Fig. 16.—Truss with flat wire for a torsion balance.

Attempts have been made to adapt the flexure-pivot system to ordinary scales and balances, but mechanical difficulties have thus far prevented their commercial success, although a number of testing-machines have been made under the Emery patents.

12. *The Torsion Balance.*—Gauss and Weber, of the University of Göttingen, experimented many years ago upon balances with a twisting wire for a pivot, but their experiments and those of some others who followed them were unsuccessful in producing a commercial balance. One of the causes of the failure of the earlier experiments was the want of a correct way of stretching the wire. This was remedied in 1882 by Prof. Frederick Roeder, of Cincinnati, who stretched the wire in the form of a brazed loop over a rigid metallic stretcher. A greater trouble, and one which seemed to be fatal to the hopes of the torsion balance, was the fact that as soon as the torsion band or wire was given sufficient size to make it strong enough to carry a desired weight the elasticity of the wire became so great as to destroy the sensitiveness of the balance. Dr. Alfred Springer, Prof. Roeder's associate, discovered that the objectionable effect of the elasticity of the wire could be entirely overcome by making the beam "top-heavy," that is, by raising its center of gravity above the point of support or axis of oscillation. He thus used the force of gravity to overcome the resistance of the wire to being twisted.

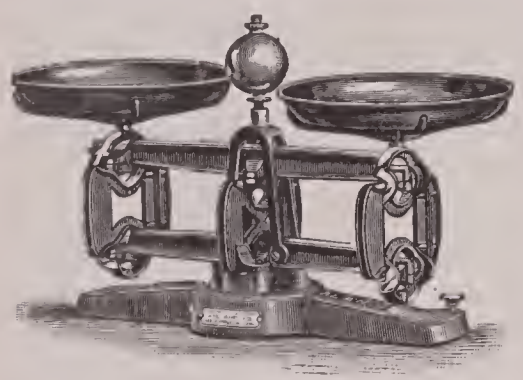


Fig. 17.—Torsion-balance counter scale.

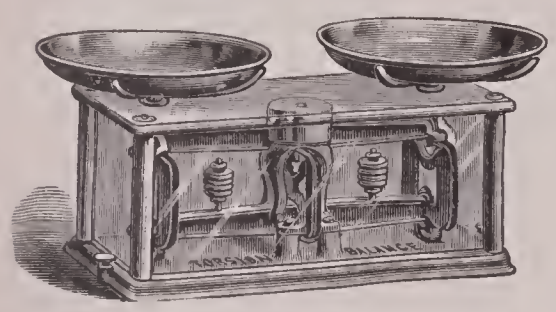


Fig. 18.—Druggist's torsion-balance counter scale.

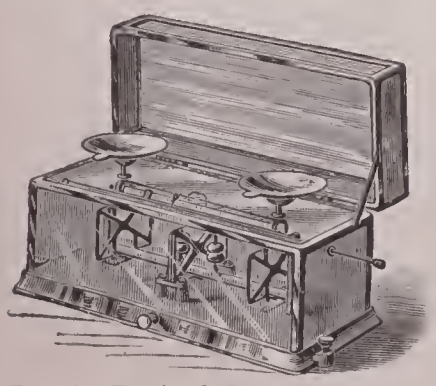


Fig. 19.—Torsion-balance prescription scale.

Numerous patents upon weighing-machines using torsion pivots were granted to Messrs. Roeder and Springer, L. M. Hosea, and the writer of this article, between 1882 and 1887. Many forms of balances upon the torsion principle are now in commercial use, while other forms, especially adapted to the automatic weighing of grain, are still in the experimental stage. Fig. 16 represents the form of truss used for ordinary grocers' and druggists' even-balance scales, with the flat wire stretched upon it. This being the middle truss, the beams, upper and lower, are rigidly attached to it at their middle points, their outer ends being attached to the wires of similar trusses, without the supporting feet, which carry the scale pans, thus forming a parallel motion. Fig. 17 shows a torsion scale made in 1884. The heavy ball, carried on a standard fastened to the lower beam, gives the necessary high center of gravity, and its vertical adjustment regulates the sensitiveness to any degree that may be desired. Figs. 18 and 19 show more modern forms of these balances, the first being a druggist's counter scale of 10 lb. capacity, sensitive to $\frac{1}{2}$ grain, and the second a prescription scale with a capacity of $\frac{1}{2}$ lb., and sensitive to $\frac{1}{64}$ grain. These balances have shown a remarkable durability, on account of the entire absence of rubbing friction, and scales made upon this principle in 1882 are still (1895) in use with no apparent diminution of their original sensitiveness. Wm. Kent.

Weights and Measures: instrumental means employed for the exact determination of quantity. Such instrumentalities are indispensable in science, in mechanical and ornamental art, and in all the variety of exchanges which constitute commerce. And as the usefulness of a system of weights and measures to those who employ it depends on the unvarying identity of its determinations, it has been a part of the public policy of every organized community, from the earliest period of civilization, to regulate such systems by law, defining the units which shall be used in measuring each species of quantity, with their multiples and sub-multiples, and providing carefully constructed standards to which the measures in actual use among the people shall be required to conform. The misfortune has been that, in past centuries, this kind of legislation has been left almost wholly in the hands of local magistracies, who have proceeded without any attempt at concert; so that in Europe, previously to 1800, scarcely a town of any commercial importance could be found, from one end of the Continent to the other, which had not its independent system of weights and measures. The embarrassment to commerce growing out of this diversity of systems was enormous. Simply to learn them was a task which few attempted, and fewer accomplished. To transform values from one into another, resort was necessary to tables, or to arithmetical rules mechanically applied, involving a large expense of both time and labor.

It is a rather curious fact that, while the mediæval systems of European weight and measure are so almost endlessly various, the similarity of their nomenclature throughout would seem to indicate a common origin. All the way from Norway, for instance, to Spain, Italy, Greece, and the Mediterranean islands, the unit of length is called everywhere the foot, and the unit of weight, the pound; and these terms, moreover, have been in use for more than 2,000 years, and have been handed down directly from the republics of Greece and the Roman empire. The word pound is simply the Roman *pondus*, a "weight," and the unit it originally represented was doubtless entirely arbitrary; but the word foot is significant, and points at once to an original prototype in nature.

The foot, as a measure of length, made its first appearance in Greece. Tradition asserts that the Olympic foot (for there were several Grecian foot-measures) was derived from the foot of Hercules. As Hercules is a mythic character, this is only to say that, at some time, a unit of length of determinate value was adopted for general use, in order to remove the uncertainties which necessarily existed when the human foot was the measure, and every man was at liberty to use his own. This determinate standard may very possibly or probably have been the length of some particular foot—the foot of some chief or hero—but after its adoption it became practically arbitrary, and the unit of length could no longer have been a dimension of the human person, but must have had for its representative an invariable bar of wood or metal.

In this example of the Grecian foot we have an illustration of the manner in which, until the introduction of the modern metric system, all units of measure originated. They were not the creation of legislation. Legislative au-

thorities have only interposed to regulate and secure uniformity and permanence in systems found already in existence. These systems have grown up in the rudest stages of society by a sort of social necessity. Without some standard of measurement, however imperfect, there can be no exchange of commodities founded on the idea of equivalence of value. And even in isolation, the uncultivated savage is forced by the exigencies of his situation to adopt some expedient by which to compare magnitudes of length, or bulk, or height, or distance. He will have need of measures in providing for his immediate personal wants—in the construction of his rude dwelling, his garments, his implements of labor, and the weapons with which he pursues his game. These must, of course, bear some convenient proportion to the dimensions of the person whose use they are designed to subserve; and nothing is more natural than that the person itself, or some of its members, should be directly employed as instruments of measurement in their construction. The same standards will then be naturally applied to other objects between which in the progress of time similar comparisons become necessary.

In regard to measurements of distance, another idea suggests itself, equally growing out of the circumstances and habits of uncivilized man. Before man had learned to subjugate animals to his service, his only means of locomotion were such as he possessed in common with these; and in estimating the moderate distances from his dwelling to which his daily walks might extend, no expedient would be more likely to suggest itself than to count his steps. Thus arose the fundamental unit of itinerary measure, which is still more or less employed for rude determinations—i. e. the pace. The Romans employed this measure, and when the distances to be measured were such as to require a larger unit, they used the *mille passuum*, 1,000 paces, from which has been derived the mile of the present day.

The nomenclature of the metrological systems of all nations furnishes abundant evidence of the original derivation of measures of length everywhere from the dimensions of the human person. The foot is a unit of comparatively modern origin. Long before Greece made any figure in history the Egyptians, the Assyrians, and the Babylonians, with whom the Israelites were contemporaneous, monopolized whatever of science and cultivation the world then possessed; and among these the cubit, derived from the length of the fore arm, of which it is the name, was the unit of linear measure, as it continues to be among their descendants to this day. With the Israelites, moreover, all the subdivisions of this unit purported to be dimensions of the person. The cubit contained two spans; the span, three palms; the palm, four digits. By a curious accident one of the identical original rules employed by Egyptian builders has been preserved to our time, and is now in the British Museum. It had been carelessly left in a hollow portion of the masonry of a temple at Karnak, and built up out of sight, was discovered among the ruins, and was brought to light uninjured after having been hidden 3,000 years. It is a two-cubit rule, and it measures exactly the breadth of the descending entrance-passage of the great pyramid of Ghizeh. Considering that the pyramid is some centuries older than the temple in which the rule was found, this accordance furnishes a striking evidence of the care bestowed on the preservation of standards of measurement in that early age.

Other measures derived from the person, of which the origin or date is unknown, are the ell (*ulna*), derived, like the cubit, from the fore arm; the Italian *braccio*, the Portuguese *braça*, the Swiss *brache*, and the Spanish *braza*, all signifying the length of the arm; the English yard, from O. Eng. *gyrdan*, to "gird," as signifying the girdle or measure of the body's circumference; the English fathom, also from O. Eng. *fæðm*, embrace, the length of two arms; to which may be added the hand, and perhaps the nail, in England, the *pouce*, or thumb's breadth, in France, and the *pulgada* in Spain, and *pollegada* in Portugal, meaning the same thing.

It is only for measures of length that the dimensions of the human person can furnish prototypes. For other descriptions of quantity the original units must have been chosen very much at random. Measures of capacity may have been derived from the content of some natural vessel, as, for instance, a gourd or the shell of a cocoanut. The *homer*, as a measure of dry capacity among the same people, signified a heap, and the *gomer*, a diminutive of this, and the hundredth part of a *homer*, signified a heap also. These names indicate that the estimate of quantity must have been made by the eye alone, and must have been vague in the extreme.

The use of weights implies some acquaintance with the balance, and therefore some degree of advancement in the arts of industry. Weights were therefore not introduced till some time after measures of length, capacity, and probably surface had become familiar. Measures of surface were naturally derived from those of length. These four classes —viz., measures of length, of surface, of volume, and of weight—are all that are commonly understood in speaking of weights and measures. But more or less intimately connected with these is the measure of value (see MONEY and COINAGE); besides which there are sundry measures belonging more properly to science, such as TIME (treated under that title and under CALENDAR); temperature (see THERMOMETRY and THERMOMETER), and angular quantity (see TRIGONOMETRY).

Though the descriptions of quantity to be measured requiring consideration here are only the four first above enumerated, yet the numbers of systems of measurement which have been simultaneously in use in the same country and among the same peoples have been usually much greater. Thus, of measures of length there are at present among us one unit for carpentry and mechanics, the foot; another for textile fabrics, the yard; another for field-surveying, the chain; and another for road-measure, the mile. The foot is subdivided to inches and lines, or inches and binary submultiples; the yard, to quarters and nails; the chain, to links and decimals; and the mile, to furlongs and rods. The superficial measures, which are the squares of these units, are equally diverse, with the addition of the agrarian dimension of the acre. Of capacity-measures there are, for liquids, the gallon, quart, pint, and gill; for cereals and other dry substances, the bushel and peck; and for firewood, the cord. Of weights there are, for ordinary commerce, the avoirdupois pound, with its sexdecimal subdivisions, and for large masses its irregular multiples of the quarter, hundred, and ton; for bullion, plate, and coin, the pound troy, irregularly subdivided; for drugs and medicines, the apothecaries' pound, equal to the troy pound, but differently subdivided; and for gems, the carat. This multiplication of systems, which is wholly unnecessary, has added much to the difficulty of dealing with problems relating to quantity.

The earliest legislation of Great Britain in relation to the subject of weights and measures is contained in the 25th chapter of the reaffirmation of the Great Charter under Henry III. (9 Hen. III., A. D. 1225), which simply declares that they shall be uniform throughout the realm; and a more explicit statute of the following year founds the measures of capacity upon weight. A later statute of 1266 (51 Henry III.) founded measures of weight upon determinate numbers of wheat-corns. Moreover, in this early period, as among the ancients, the units of commercial weight were also units of coin-weight. Thus the statute referred to provided that "an English penny, called a *sterling*, round and without any clipping, shall weigh thirty-two wheat-corns in the midst of the ear, and twenty pence do make an ounce, and twelve ounces one pound, and eight pounds do make a gallon of *wine*, and eight gallons of wine do make a London bushel, which is the eighth part of a quarter." The pound thus determined, known as the tower pound, or the sterling or easterling pound, continued to regulate the metrological system of England down to 1496, when it was superseded for this purpose by the troy pound (12 Hen. VII.). It was a pound of 15 ounces, each ounce being equal to 360 troy grains, or to three-quarters of a troy ounce; whence the weight of the penny sterling was only 22½ grains troy. The grain-weight troy was not, therefore, the weight of a grain of wheat, as the word would seem to indicate. The grain of *marc*, used in France in the time of Charlemagne and later, was about four-fifths as heavy as the troy grain; and this, though still exceeding the grain of wheat, is nearer to it, and was probably derived from it. The easterling pound was the pound of the Eastern nations of Europe, and, as we may infer from Camden, was introduced into England in the time of Richard Cœur de Lion.

It is matter of controversy at what period the troy and avoirdupois pounds were introduced into England. The earliest statute in which the troy pound is mentioned is one of 1414 (2 Hen. V.), intended to regulate the charges of goldsmiths for gilding silver plate. In 1496, however, it was by statute of 12 Hen. VII. substituted for the ster-

ling pound for the regulation of measures of capacity, the sterling pound continuing to be used at the mint: but by a subsequent statute of 1527 (18 Hen. VIII.), this last was definitely abolished. In the earliest statutes in which the word avoirdupois is used—viz., 9 Edw. III. (1335) and 27 Edw. III. (1353)—it is applied not to a system of weights, but to the goods themselves which are to be weighed.

The earliest legislation in regard to measures of length found in the British statute-book is of date 1324 (17 Edw. II.), and provides that the inch shall have the length of three barleycorns, round and dry, laid end to end; that 12 inches shall make a foot, and 3 feet a yard. Previously to the Conquest, the British yard, according to Prof. Wackerbarth of the University of Upsala, Sweden, had about the length of 39·6 inches. It was reduced in length in 1101 by being adjusted to the arm of Henry I.; but the artificial standards, deposited in the exchequer, were very ill cared for, and became soon untrustworthy; which may have perhaps suggested this reference to a new though exceedingly imperfect natural standard, the barleycorn.

During the eighteenth century attention was drawn to this subject, and legislation was proposed, if not perfected, aiming at an exactness before unattempted. Careful comparisons of the British, French, and Roman standards appear in the *Transactions* of the Royal Society for 1736, 1742, and 1743. Graham, the eminent horologist, determined the length of the seconds pendulum in London to be 39·130 inches, afterward corrected to 39·14 inches; and prepared for the society a standard yard in 1742. In 1818 a royal commission was appointed by a writ of the privy seal, with Sir Joseph Banks, president of the Royal Society, as chairman, which, after making a thorough investigation, made recommendations which were embodied in a statute which went into effect Jan. 1, 1826. This enacted that "the straight line or distance between the centres of the two points in the gold studs in the straight brass rod now in the custody of the clerk of the House of Commons, whereon the words and figures 'Standard Yard, 1760,' are engraved, shall be, and the same is hereby declared to be, the original and genuine standard of that measure of length or linear extension called a yard"; and that the same distance, "the brass being at the temperature of sixty-two degrees by Fahrenheit's thermometer, shall be, and is hereby denominated, the 'Imperial Standard Yard,' and shall be, and is hereby declared to be, the unit, or only measure of extension wherefrom or whereby all other measures of extension whatsoever, whether the same be linear, superficial, or solid, shall be derived, computed, and ascertained." The act also provided that in case such standard should be lost or injured it should be restored by reference to the length of "the pendulum vibrating seconds of mean time in the latitude of London in a vacuum at the level of the sea"; which length was declared to be 39·1393 inches. In regard to weights, it declared a brass 1-lb. weight made in the year 1758, then in the custody of the clerk of the House of Commons, to be authentic, and named it the "imperial standard troy pound." It further declared that the said standard pound should contain 12 oz. of 20 pennyweights, each pennyweight containing 24 grains, "so that 5,760 such grains shall be a troy pound; and that 7,000 such grains shall be, and are hereby declared to be, a pound avoirdupois." For the case in which such pound should be lost or injured, provision was made in the original bill for its restoration by reference to the weight of a cubic inch of water, which, as weighed in a vacuum, "by brass weights also in a vacuum, at the temperature of 62° of Fahrenheit's thermometer," was declared to be "equal to 252·724 grains." Before its final passage, however, in 1824, the weight of the cubic inch of water weighed by brass weights *in air* (declared to be 252·458 grains at 62° F. and 30 inches barometric pressure), was substituted for the weight *in vacuo*. As to measures of capacity, it was enacted that the standard measure, whether for liquids or for dry goods, should be the gallon, containing, at the temperature of 62° F., with the barometer at 30 inches, 10 lbs. avoirdupois weight of distilled water weighed in the air; and the construction of such a measure of brass was ordered, which was to be called the "imperial standard gallon." It is further declared that the standard gallon ascertained by this act is equal in bulk to 277·274 cubic inches at the temperature of 62° F.

In 1834 the houses of Parliament were destroyed by fire, and with them the "original and genuine" standards. Practical difficulties were found in the way of replacing the yard by the means prescribed in the act. A commission appointed in 1838 under Airy, the astronomer-royal, reported against the pendulum method, and taking the best secondary evidence produced a standard bar of gun-metal, 38 inches long and 1 inch square, the distance between two lines on which, crossing two gold studs, is one yard, at 62° F. and 30 inches barometric pressure. The pound was reproduced from the copy in the mint. These standards were legalized by act of Parliament (18 and 19 Vict., chap. 72). The Weights and Measures Act of 1878 (41 and 42 Vict., chap. 49) regulates the law, rendering all old and local weights and measures, other than imperial ones, illegal.

Early in the colonial history of the U. S. the British exchequer standards of weights and measures had been legalized by many of the colonial legislatures. They were not always specified by name in the earlier acts, but were always implied, and in subsequent legislation were sometimes incidentally named. Thus in Virginia, an order of the General Assembly of Mar. 5, 1623 (N. S. 1624), directed that no weights or measures should be used, but such as should be sealed by officers appointed for the purpose. But by an act of Feb. 23, 1631–32, it was ordained "that a barrel of corn should be accounted five bushels of Winchester measure," which was then the British bushel; and another act, of Oct. 5, 1646, provided that "no merchant or trader, whether English or Dutch, shall trade with other weights and measures than according to the statute of Parliament in such cases provided." In Massachusetts also an act of 1647 directed the treasurer of the commonwealth to "provide weights and measures of all sorts for continual standards." Other statutes provided that casks should be "of London assize." In 1730 a set of brass and copper avoirdupois weights and measures was imported from the British exchequer, and in 1765 the treasurer was required to procure a balance and a nest of troy weights. After the Revolution, by act of Feb. 26, 1800, the principal provisions of the colonial statutes in regard to weights and measures were confirmed. New Hampshire and Vermont appear to have followed Massachusetts in their colonial legislation as to measures of capacity, but in neither of them was there any distinct recognition of troy weight. Rhode Island passed no statute on the subject at all. In Connecticut, after the Revolution, it was enacted (Oct., 1800) "that the brass measures, the property of this State, kept at the treasury—that is to say, a half-bushel measure containing one thousand and ninety-nine cubic inches, very near, a peck measure, and a half-peck measure, when reduced to a just proportion—be the standard of the corn-measures of this State which are called by those names respectively; that the brass measures ordered to be provided by this Assembly—one of the capacity of two hundred and twenty-four cubic inches, and the other of the capacity of two hundred and eighty-two cubic inches—shall be, when procured, the first of them the standard of a wine-gallon, and the other the standard of the ale or beer gallon in this State; that the iron or brass rod or plate ordered by this Assembly to be provided—of one yard in length, to be divided into three equal parts for feet, in length, and one of those parts to be subdivided into twelve equal parts for inches—shall be the standard of those measures respectively; and that the brass weights, the property of the State, kept at the treasury—of one, two, four, seven, fourteen, twenty-eight, and fifty-six pounds—shall be the standard of avoirdupois weight in this State." By the colonial laws of the same State, it appears that there were public standards provided as early as 1670, and in 1752 the gallon of 231 cubic inches had been established. As this was the gallon of Queen Anne (1706), which continued from her time down to 1826 to be the standard wine-gallon of England, and as the gallon of 224 cubic inches is the old gallon of Henry VII. (1496), it is difficult to account for the enactment just cited. The half-bushel of 1,099 cubic inches was never at any time a British measure. Connecticut never by express law sanctioned the use of troy weights, but, in her tax-laws, silver plate is rated at $1.11 an ounce, by which a troy ounce must have been intended. The earliest legislation sanctioned the London assize of casks. The provincial legislature of New York, on June 19, 1703, established all the British weights and measures for the province "according to the standards in the exchequer." In 1829, however, in a revision of the statutes, a provision was embodied adopting the British imperial bushel, and a gallon measure capable of containing 8 lb. of distilled water at maximum density. In the same code it was also provided that the standard yard should bear to the pendulum beating seconds at Columbia College, New York city, *in vacuo*,

at the level of the sea, the proportion of 1,000,000 to 1,086,-141. New Jersey in Aug., 1725, adopted the exchequer standards of England. The same was done in Pennsylvania in 1700, in Delaware in 1705, and in Maryland in 1671. The colony of North Carolina prohibited the use of any weights and measures but such as should be constructed "according to the standard in the English exchequer." South Carolina in 1768 passed an act requiring the public treasurer to procure avoirdupois weights of brass or other metal, and also a bushel and other measures of capacity, "according to the standard of London." In Georgia no colonial legislation appears to have taken place upon this subject. After the Revolution, by act of Dec. 10, 1803, the standard of weights and measures established by the city corporations of Savannah and Augusta is declared to be the standard of the State till such time as the Congress of the U. S. shall have made a different provision. Of the States admitted to the Union since the adoption of the Constitution of 1787, some have passed laws similar to those above described, and some have not legislated at all. The case of Louisiana was peculiar. Before the acquisition of that territory by the U. S. the weights and measures used in the province were those of the old standard of Paris. An act of the Legislature of Dec. 21, 1814, required the Governor to procure, at the expense of the State, weights and measures corresponding with those used by the revenue officers of the U. S., to be deposited with the Secretary of State, and to serve as the general standard for the State.

The condition of the matter of standards of measure in the U. S. is essentially as follows: Although the Constitution authorizes Congress to fix the standard of weights and measures, this power has never been definitely exercised, and comparatively little legislation has been enacted on the subject. Its importance was recognized by Washington, Jefferson, and Adams, and as early as 1790 Jefferson proposed to "reduce every branch to the decimal ratio already established for coins, and thus bring the calculation of the principal affairs of life within the arithmetic of every man who can multiply and divide." The failure on the part of Congress to exercise the powers conferred by the Constitution made it necessary for the executive branch of the Government to take action in the way of procuring standards for use in the collection of revenue, and other operations in which weights and measures were required. A brass scale by Troughton, of London, was obtained by the U. S. Coast and Geodetic Survey in 1814. It was 82 inches in length, and a part of it (from the 27th to the 63d inch line) was tentatively adopted as the unit of length. A platinum meter and kilogramme were procured by Gallatin in 1821, and a copy of the English troy pound was brought from London, also by Gallatin, in 1827. The latter became, by act of Congress 1828, the standard of mass for the mint of the U. S., and, although totally unfit for the purpose, it has since continued to be the legal standard for coinage purposes. In 1830 an examination of the standards of weight and measure used in the principal custom-houses of the country disclosed large discrepancies, and led to the adoption by the Treasury Department of the Troughton scale as a standard of length and the avoirdupois pound derived from the troy pound of the mint as the unit of mass. At the same time, the department adopted the wine gallon of 231 cubic inches for liquid measure, and the Winchester bushel of 2,150·42 cubic inches for dry measure. In the meantime most of the States had passed laws relating to weights and measures, as explained above, and the standards adopted were in many instances essentially different, so that the confusion which had prevailed during and since the colonial period promised to become greater rather than less. In order to encourage uniformity, the Secretary of the Treasury was authorized in 1836 to cause a complete set of all weights and measures adopted as standards by the department for the use of the custom-houses and for other purposes to be delivered to the Governor of each State in the Union for the use of the States respectively, thus furnishing material standards, the adoption of which would secure practical uniformity throughout the country. These standards were generally adopted by action of the State authorities, and in this way the words *pound* and *yard* have come to have everywhere in the U. S. the same meaning as far as their practical use is concerned, although rigorously speaking the standards of no two States can agree exactly. There are still wide differences and great confusion in the legislation affecting volume units, especially where it is attempted to relate volume to mass as in defining the number of pounds in a bushel of various grains, fruits, etc.

The first and almost the only general legislation on the subject of weights and measures was the act of Congress of July 28, 1866, making the use of the metric system lawful throughout the U. S., and defining the weights and measures in common use in terms of the units of that system. In 1875 an international metric convention was agreed upon by the principal governments of the world, including the U. S., at which it was undertaken to establish and maintain at common expense a permanent international bureau of weights and measures, the first object of which should be the preparation of a new international standard metre and a new international standard kilogramme, copies of which should be made for distribution among the contributing governments. This distribution was effected by lot in 1889, and the U. S. received metres Nos. 21 and 27 and kilogrammes Nos. 4 and 20. They are made of an alloy of platinum with 10 per cent. iridium. On Jan. 2, 1890, metre No. 27 and kilogramme No. 20 were adopted as the national prototype metre and kilogramme.

The pound and yard, which, by reason of their adoption by the Treasury Department, had become the customary units throughout the country, were based upon standards copied from those in use in England in the early part of the nineteenth century, as explained above. After the destruction of the latter at the burning of the Parliament House in 1834, it was the policy in the U. S. to make the yard and pound the exact equivalents of the new imperial standards adopted by Great Britain, although these were derived from surviving copies of the old units, and unquestionably differ slightly from them. The earlier standards—namely, the Troughton scale and the mint troy pound—were quite inferior in construction and unsuitable for standards of high precision. Accurate copies of the new imperial standards were received at the office of weights and measures in Washington, and became the prototypes for all refined comparisons. This practice could not affect, however, the legal requirement that the troy pound should be the standard for coinage purposes.

During recent years, and especially since the receipt of the national prototype metre and kilogramme, it has been the practice to make final reference to accepted metric standards. The law of 1866 had defined the yard in terms of the metre so accurately that the most recent and most carefully conducted comparisons do not show it to be in error, and the pound in terms of the kilogramme so as not to differ from the English pound avoirdupois by as much as 1 part in 100,000, and in view of these facts, and in the absence of any material normal standards of customary weights and measures, the Secretary of the Treasury, on Apr. 5, 1893, formally approved the recommendation of the superintendent of weights and measures, that in the future the international prototype metre and kilogramme be regarded as the fundamental standards of length and mass for the U. S. Government, and that the customary units, the yard and the pound, be derived from them in accordance with the act of July 28, 1866. The result of this action is that, as far as the jurisdiction of the Treasury Department extends in this matter, the yard is now defined as being $\frac{3600}{3937}$ of a metre, and the pound avoirdupois $\frac{1}{2{\cdot}2046}$ of a kilogramme, thus putting these standards in direct relation with those of other civilized nations, in all of which, with only one or two exceptions, the metric system is now in use. The only legislation on the subject of weights and measures by which the entire country is affected, except the act of 1866 above referred to, is an act establishing a gauge for sheet metal, and another approved July 12, 1894, in which Congress defined eight units for the measure of electrical quantity. These units are derived from the fundamental units of length, mass, and time of the metric system. They were agreed upon by an international congress of electricians which met in Chicago in 1893, and have been essentially accepted by Great Britain and other foreign governments. They are defined in the article on UNITS (*q. v.*).

Revised by T. C. MENDENHALL.

Weights, Atomic: See CHEMISTRY.

Wei-hai-wei, wā-hī-wā: a port of Shantung, China; lat. 37° 30′ N., lon. 122° 28′ E. The harbor is large and well sheltered on all sides, an island (Liu-kung-tao), in the mouth of the bay, protecting it from the N. E. winds. It was the seat of an important arsenal and strongly fortified, but was taken and dismantled by the Japanese after a stubborn resistance in the spring of 1895. In May, 1898, Wei-hai-wei and the adjacent islands were leased to Great Britain for 99 years.

Weil, Henri: classical scholar; b. at Frankfort-on-the-Main, Germany, Aug. 26, 1818; studied in Bonn, Berlin, and Leipzig; took the degree of Doctor of Letters in Paris 1845; associate professor at the Faculty of Letters in Strassburg in 1847; was naturalized in 1848, appointed professor at the Faculty of Letters at Besançon in 1849, and in 1876 called to Paris as Professor of Greek at the École normale supérieure and the École des hautes études. Among his publications, chiefly devoted to Greek oratory and tragedy, are his editions of *Æschylus* (2d ed. 1884); seven plays of *Euripides* (2d ed. 1879); *Les harangues de Démosthène* (2d ed. 1881); *Les plaidoyers politiques de Démosthène* (2 vols., 1877–86): and his famous treatise, entitled *De l'ordre des mots dans les langues anciennes comparées aux langues modernes* (Paris, 1845; 3d ed. 1879). Alfred Gudeman.

Weilen, vī'len, Joseph, von: dramatist; b. at Tetin, Bohemia, Dec. 28, 1828; studied at Prague and Vienna; served in the Austrian army in Hungary in 1848, and was appointed Professor of History and Geography at the engineering academy of Znaim in 1854, Professor of the German Language and Literature at the military academy in Vienna, and custodian at the imperial library in 1861. His poems, *Phantasien und Lieder* (Vienna, 1853) and *Männer vom Schwerte* (Vienna, 1855), attracted some attention, and several of his dramas had still more success—*Tristan* (Breslau, 1860; 2d ed. 1872); *Edda* (Vienna, 1865); *Drahomira* (Vienna, 1867); *Graf Horn* (Leipzig, 1871); and *Der neue Achilles* (Leipzig, 1872). D. in Vienna, July 3, 1889.
Revised by Julius Goebel.

Weimar, vī'mär: capital of the grand duchy of Saxe-Weimar: on the Ilm, and on the Prussian and Thuringian-Saxon railways (see map of German Empire, ref. 4–F). It is a quiet, neat, pleasant, and aristocratic place, contains few imposing edifices, and has hardly any trade or manufactures; its population is 24,546 (1890). In 1547 it became the permanent residence of the Ernestinian line (the Albertinian line reigns in Dresden), and was conspicuous during the second classical period of German literature, when Wieland, Herder, Goethe, Schiller, and many lesser authors at the court of Karl August filled the world with the fame of their classicism. The grand-ducal castle, rebuilt in 1774 after the great fire, is very rich in relics and memorials of that time. Other places of interest are a park established by Karl August and Goethe, the library with 180,000 vols. besides statues and portraits, the state archive with rich historical treasures, the court theater, Goethe's house (from 1782–1832) now opened as a Goethe museum, Schiller's humble residence (from 1802–05), the permanent exposition of art and art industry, containing also a Japanese museum, all these combining to make the "German Athens" a literary center which is visited by thousands from all civilized countries. In the grand-ducal burial vault Schiller and Goethe rest side by side. Within the old parish church are the tombs of Herder and Duke Bernhard of Weimar (see Bernhard), the hero of the Thirty Years' war. Beautiful statues of princes and poets adorn the city and the classical environs, where are the castles of Belvedere, Tiefurt, Ettersburg, and Ossmanstedt with Wieland's grave. See Franke, *Weimar und Umgebungen* (Weimar, 1886). Hermann Schoenfeld.

Weimar: town (founded in 1873); Colorado co., Tex.; on the S. Pac. Co.'s Railroad; 16 miles W. of Columbus, the county-seat (for location, see map of Texas, ref. 5–I). It has 6 churches, a private and 2 public schools, 2 private banks, a weekly newspaper, electric lights, oil-mills, and manufactories of vinegar, blueing, sash and doors, corn and cotton planters, and post-hole diggers. Pop. (1880) 626; (1890) 1,443; (1900) 1,337. Publisher of "Mercury."

Weimar, Duke of: See Bernhard.

Weinsberg, vīns'bärch: small town; 3 miles E. N. E. of Heilbronn, in the kingdom of Würtemberg, Germany; formerly a free imperial city; in the Neckar district, in the center of the densely populated Weinsberg valley: a station of the Würtemberg state railways (see map of German Empire, ref. 6–E). Pop. (1890) 2,313. It has a classical school and an interesting church built in the thirteenth century in the Roman style. Over the town are the picturesque ruins of the castle Weibertreu, so called in memory of the famous legend celebrated by Bürger's ballad. Emperor Conrad III., after the victory over Count Welf in 1140, besieged the rebellious vassal in Weinsberg and, irritated by the desperate resistance of the besieged, he ordered—so the legend runs—that all the men in the town should be put to death, and only the women should leave the town with their most precious property. On the day of surrender the women marched out carrying their husbands on their backs. The stratagem succeeded. See Dillenius, *Chronik von Weinsberg* (Stuttgart, 1860); Bernheim, *Die Sage von den treuen Weibern zu Weinsberg* (1875). Hermann Schoenfeld.

Weir, weer: city; Cherokee co., Kan.; on the Kan. City, Ft. Scott and Mem. and the St. L. and San Fran. railways; 31 miles E. of Parsons, 137 miles S. of Kansas City (for location, see map of Kansas, ref. 8–K). It is in a coal-mining region, and has a zinc-manufacturing plant with capacity of 78,000 lb. of spelter a day. There are 6 churches, 3 public schools, a State bank with capital of $7,000, and 2 weekly newspapers. Pop. (1880) 376; (1890) 2,138; (1900) 2,977.
Editor of "Weir City Tribune."

Weir, Harrison William: illustrator; b. at Lewes, England, May 5, 1824; was apprenticed to a wood-engraver at London; gave great attention to natural history and studied water-coloring painting; was one of the original members of the Society of Painters in Water-colors: became noted for his wood-engravings of animals in the *Illustrated London News*, the *Children's Friend*, the *Band-of-Hope Review*, and other periodicals, and by his illustrations to several books on natural history. He is the author of *The Poetry of Nature* (1865); *Funny Dogs with Funny Tales*; *The Adventures of a Bear*; *Bird Stories, Old and New*; *Our Cats, and all about Them*, and other works, some of which were illustrated by himself.

Weir, John Ferguson: portrait and genre painter; b. at West Point, N. Y., Aug. 28, 1841; pupil of his father, R. W. Weir; visited Europe in 1868; National Academician 1866; director of the Yale School of Fine Arts, New Haven, 1869. He is also a sculptor. *The Culprit Fay*, *Christmas Bell*, *Forging the Shaft*, and *The Confessional* are among his principal works. His studio is in New Haven. W. A. C.

Weir, Julian Alden: portrait, landscape, and genre painter; b. at West Point, N. Y., Aug. 30, 1852; pupil of his father, R. W. Weir, and of Gérôme in Paris; member Society of American Artists 1877; National Academician 1886; member of American Water-color Society; honorable mention Paris Salon 1882; second-class medal Paris Exposition, 1889, and third-class medal for drawings. The works of his earlier period are somber in tone and possess depth of color and distinction of general aspect. Since 1887 he has followed the impressionist methods of painting and produced a number of landscapes that are notable for luminous and atmospheric quality. His pictures, whatever their style or manner of painting, are marked by artistic treatment. His studio is in New York. William A. Coffin.

Weir, Robert Walter: historical and genre painter; b. at New Rochelle, N. Y., June 18, 1803; pupil of Jarvis; began to paint portraits in 1821; went to Florence in 1824 and studied with Benvenuti; National Academician 1829; Professor of Drawing at the U. S. Military Academy 1837–79. D. in New York, May 1, 1889. His *Embarkation of the Pilgrims* is in the Capitol at Washington, D. C. W. A. C.

Weishaupt, vīs'howpt, Adam: the founder of the Society of the Illuminati (*q. v.*).

Weismann, vīs'män, August: naturalist: b. at Frankfort-on-the-Main, Germany, Jan. 17, 1834; studied medicine at Göttingen, and was for a time physician to the Archduke of Austria; then turned to zoölogy, and for many years has been professor in the University of Freiburg in Baden. He has published numerous papers on the structure and development of insects and crustacea, and later has devoted himself to more philosophical questions. His writings have been the greatest stimulation to research of any since the publication of Darwin's *Origin of Species*. Among his most important works are *Entwickelung der Dipteren* (Leipzig, 1863); *Beiträge zur Kenntniss der Daphnoiden* (Leipzig, 1876–80); *Studies in the Theory of Descent* (1880); *Essays on Heredity* (1888–92); and *Germ Plasm* (1893). For his peculiar views, see Heredity. J. S. K.

Weiss, wīs, John: author; b. in Boston, Mass., June 28, 1818; graduated at Harvard College in 1837; taught at Chauncy Hall and Jamaica Plain; entered the Cambridge Divinity School in 1840; passed the winter of 1842–43 in Heidelberg, Germany; graduated at the Harvard Divinity School, and settled in Watertown in 1843; withdrew on account of strong anti-slavery opinions, and went in 1847 to New Bedford; left soon by reason of failing health; spent some years in repose, quiet study, and travel; was minister

again in Watertown 1859–70; retired in order to devote himself to literature; published in 1845 a translation of Schiller's philosophical and æsthetic essays, *Æsthetic Prose*; *Life and Correspondence of Theodore Parker* (2 vols., New York, 1864); *American Religion* (Boston, 1871); *Wit, Humor, and Shakespere* (Boston, 1876); *The Immortal Life* (Boston, 1880). Weiss was one of the leading disciples of the Transcendental philosophy, an ardent abolitionist, a zealous champion of woman's political emancipation, and an apostle of rationalism in religion. D. Mar. 9, 1879.

Weiss, JOSEPH: See the Appendix.

Weissbrunn: See VESZPRIM.

Weissenfels, *vīs'en-fels*: a city in the Prussian province of Saxony; station of two Prussian state railways: on the Saale, 18½ miles S. W. of Leipzig (see map of German Empire, ref. 4–F). It has considerable trade in wood and grain, and several cotton spinning and weaving factories, and manufactures leather goods, paper, porcelains, and articles of gold and silver. Sandstone and coal are worked in the vicinity. Weissenfels has a spacious market-place, three fine churches, a teachers' seminary, a deaf-mute institute, and a pro-gymnasium. Pop. (1890) 23,779. H. S.

Weit'spekan Indians: a family of North American Indians of Northeastern California. They take their name from *Weitspek*, a village at the junction of the Trinity and Klamath rivers. The family has also been called Yurok, a Karok (Quoratean) word signifying *down* or *below*.

The area occupied by the family includes the territory from the junction of the Trinity and Klamath rivers to the Pacific, extending northward a short distance beyond the mouth of the Klamath and Little and Mad rivers. It is therefore mainly within the limits of Humboldt co., California. The tribes were separated into two divisions—the Yurok, inhabiting Klamath river and the coast from a few miles above the mouth of the latter river southward to Gold Bluff; and the Chilula, extending from the latter point to the southern boundary of the family, particularly along Redwood creek. The latter, however, were long ago removed to the reservation of the Hupa, by which tribe they were absorbed.

The Yurok are physically inferior to the Karok, their eastern neighbors. On the coast the natives are inclined to be pudgy, while the inland inhabitants of the Klamath are of finer form. They are also much darker than the Karok, and have lower foreheads and more projecting chins. Both the Yurok and Chilula, like nearly all the Californian tribes, were divided into a number of petty villages, each with a political head of only nominal authority. The Yurok recognized also a tribal chief.

The houses of the Yurok are similar to the Karok habitations. They are squarely constructed of split poles or puncheons planted erect in the ground and covered with a flattish puncheon roof. Sometimes this cabin is erected on the level ground; more frequently, however, it is built over a circular cellar 12 or 15 feet in diameter. They depend for their livelihood largely upon their own labor, being employed by neighboring miners, and as pack-train drivers, farm hands, etc. They make and sell canoes of redwood (the capacity of some being 5 tons) and transport passengers and merchandise on the river. The women weave from willow twigs and pine roots large round mats, hats, and water-tight baskets of various shapes and designs for household use. The Yurok cling to the use of the bow and arrow, although in the latter points of metal have succeeded the primitive stone arrowheads. They continue to use flint and jasper knives in cleaning and cutting salmon. This fish forms their principal food, and large quantities are obtained by means of nets woven of pine roots or grass, as well as by the spear and line.

Being strictly a maritime people, the Yurok are rather inferior hunters, but expert and fearless watermen. They are monogamists; marriage is practically by purchase, the purchase price being returned to the husband by the wife's father in event of divorce, which is easily obtained. The dead are buried in a recumbent posture, and a fire is made on certain nights in the vicinity of the grave, presumably to guide the departed soul on its darksome journey. They believe in the transmigration of the soul, and that the wicked return in the form of weak animals, to be harried and devoured. They now recognize the existence of a Supreme Being, known to them as "Gard," which would seem to denote Christian influence. At the time of the advent of the whites into their country the Yurok are said to have numbered about 5,000. In 1870 the population was about 2,700, which number has considerably decreased. See INDIANS OF NORTH AMERICA. J. W. POWELL.

Weitzel, GODFREY; soldier; b. in Cincinnati, O., Nov. 1, 1835; graduated at the U. S. Military Academy July, 1855, and became second lieutenant of engineers; served in the construction and repairs of fortifications about New Orleans until 1859, when he was transferred to West Point as Assistant Professor of Engineering. In the early part of the civil war he served in the defense of Fort Pickens Apr.–Sept., 1861, and was chief engineer in the department of the Ohio Oct.–Dec., 1861. On the organization of Gen. Butler's expedition to New Orleans Weitzel was selected as chief engineer. He planned the capture of New Orleans, and on its fall was appointed acting military commander and mayor of the city. Commissioned brigadier-general of volunteers Aug. 29, 1862, he drove the Confederates from the La Fourche district, the battle of Labadieville occurring Oct. 27. He commanded the district until Apr., 1863, when he joined his force to that besieging Port Hudson, and, upon its surrender, was given the first division of the Nineteenth Corps; engaged in the expedition to Sabine Pass. In Apr., 1864, he was ordered to Virginia, and was chief engineer of the Army of the James (May–Sept., 1864), constructing the defenses of Bermuda Hundred and Deep Bottom, and in command of second division of Eighteenth Corps was engaged in the various operations of that army, including the actions near Drury's Bluff. In Nov., 1864, he was promoted major-general, and in December was given the Twenty-fifth Corps. He accompanied Butler's unsuccessful expedition to Fort Fisher as second in command. The troops N. of the Appomattox were assigned to him in Mar., 1865, and on the morning of Apr. 3 he took possession of Richmond. He commanded a military district in Texas Apr., 1865, to Mar., 1866, when he was mustered out of volunteer service. He received the brevets of major, lieutenant-colonel, colonel, brigadier and major general in the regular army. Returning to duty with his corps, in which he was made major in Aug., 1866, he was afterward engaged on engineering work in connection with the Louisville and Portland Canal, St. Mary's Falls Canal, improvement of the falls of the Ohio, etc., and on lighthouse construction, and was promoted lieutenant-colonel of engineers 1882. D. in Philadelphia, Mar. 19, 1884. Revised by JAMES MERCUR.

Weizsäcker, *vīts'sek-er*, KARL HEINRICH, von, Ph. D., D. D.: Protestant theologian; b. at Oehringen, Würtemberg, Germany, Dec. 11, 1822; became privat docent of theology at Tübingen 1847; professor there, in succession to Baur, 1861; and chancellor of the university in 1890. In 1848 he became preacher at Stuttgart, in 1851 court chaplain, in 1859 was made a member of the superior consistory. Of his numerous publications may be mentioned *Zur Kritik des Barnabasbrief aus dem Codex Sinaiticus* (Tübingen, 1863); *Untersuchungen über die evangelische Geschichte, und den Gang ihrer Entwickelung* (Gotha, 1864; 2d ed. Freiburg im Br., 1891); *Lehrer und Unterricht an der evangelisch-theologischen Facultät der Universität Tübingen von der Reformation bis zur Gegenwart* (Tübingen, 1877); *Das apostolische Zeitalter der christlichen Kirche* (Freiburg im Br., 1886; 2d ed. 1892; Eng. trans., *The Apostolic Age of the Christian Church*, London and New York, 1894); and especially his much admired translation of the New Testament, which is one of the best productions of the kind (Tübingen, 1875; 7th ed. Freiburg im Br., 1894). SAMUEL MACAULEY JACKSON.

Welch, ASHBEL: civil engineer; b. at Nelson, N. Y., Dec. 4, 1809. In 1827 he began engineering work on the Lehigh Canal. In 1835 he was appointed chief engineer of the Delaware and Raritan Canal, and later he located and built the Belvidere and Delaware Railroad. In 1853 he prepared the plans for the Delaware and Chesapeake Canal. After 1862 he was manager, and later president of the Pennsylvania Railway lines in New Jersey. He was the first to introduce in the U. S. the block system of operating trains. He was the author of papers on railway engineering and economics. In 1881 he was elected president of the American Society of Civil Engineers. D. at Lambertville, N. J., Sept. 25, 1882. MANSFIELD MERRIMAN.

Welch, PHILIP HENRY: humorist; b. at Angelica, N. Y., Mar. 1, 1849. He was engaged in mercantile business till 1882, when he became connected with the Rochester, N. Y., *Post-Express*. In 1884 he joined the staff of the New York *Sun*, furnishing its columns with jokes and short humorous

dialogues which became famous. These he turned off in exhaustless profusion, many of them from his sick-bed, during a long and painful illness. D. in Brooklyn, N. Y., Feb. 24, 1889. He was the author of *The Tailor-made Girl* (1888) and *Said in Fun* (1889). HENRY A. BEERS.

Welch, WILLIAM HENRY, M. D., LL. D.: pathologist; b. at Norfolk, Conn., Apr. 8, 1850; graduated at Yale College 1870, and at the College of Physicians and Surgeons, New York, 1875; studied pathology at the Universities of Strassburg, Leipzig, Breslau, and Berlin; was demonstrator of Anatomy and Professor of Pathological Anatomy in Bellevue Hospital Medical College, New York, 1878–83; in 1884 was elected Professor of Pathology in Johns Hopkins University, and has been pathologist to Johns Hopkins Hospital, Baltimore, since its opening in 1889. He was president of the Medical and Chirurgical Faculty of the State of Maryland in 1891–92. He is the author of the sections on pathology and pathological anatomy in the fifth (1881) and sixth (1886) editions of Flint's *Theory and Practice of Medicine*; of the chapter on *Organic Diseases of the Stomach* in Pepper's *System of Medicine* (1885); of the chapter on *General Considerations concerning the Biology of Bacteria, Infection and Immunity* in Pepper's *Text-book of the Theory and Practice of Medicine* (1894); of the Cartwright lectures on the *General Pathology of Fever* (1888); and of numerous papers on pathological and histological subjects in German and American medical journals. S. T. ARMSTRONG.

Welcker, *vel'ker*, FRIEDRICH GOTTLIEB: Greek scholar and archæologist; b. at Grünberg, Hesse, Germany, Nov. 4, 1784; studied at Giessen; was tutor in the home of Wilhelm von Humboldt in Rome (1806–09); called to the chair of Archæology at Giessen; took part in the French campaign (1814); professor at Göttingen in 1816, at Bonn 1819; deposed for political reasons in 1832, but soon reinstated. Owing to failing eyesight, however, he retired in 1861. D. at Bonn, Dec. 17, 1868. Welcker was one of the greatest classical scholars of the nineteenth century, and his numerous writings on Greek literature, mythology, and art possess a permanent value. Only a few of the most famous can be mentioned here: *Alte Denkmäler* (5 vols., Göttingen, 1849–64); *Griechische Götterlehre* (3 vols., Göttingen, 1863); *Die griechische Tragödie mit Rücksicht auf den epischen Cyclus geordnet* (3 vols., Bonn, 1841), an epoch-making work; *Der epische Cyclus* (3 vols., Bonn, 1835–49; 2d ed. 1865–82); *Aeschyleische Trilogie* (Darmstadt, 1824; supplement, Frankfort, 1826). Editions of Alcman, Hipponax, Philostratus's *Imagines*, Theognis, Hesiod's *Theogony*; *Kleine Schriften*, 6 vols., among which the treatises on *Sappho* and *Prodicus* are especially noteworthy. See the biography by Reinhold Kekulé (Leipzig, 1880).
ALFRED GUDEMAN.

Weld, Wold, or **Dyer's Weed**: the *Reseda luteola*, an annual herbaceous plant which is a native of the southern parts of Europe, but has been naturalized in the U. S. It contains a yellow coloring-matter termed luteoline which is highly esteemed for its durability, and ranks among vegetable dyes next to the Persian berry. Luteoline is extracted from the plant by treatment with boiling water; it is more soluble in alcohol and in ether; when heated it sublimes and condenses in yellow needles; it furnishes yellow lakes with lead acetate, alum, and tin chloride, and is extensively used for imparting a gold color to silks and for paper-staining. The entire plant is also employed for dyeing purposes in Europe, including England, but its consumption has greatly diminished since the introduction of quercitron. In preparing baths from weld the exhausted plant should be removed from the liquid, and the latter used as soon as possible, as its decoction speedily undergoes decomposition on exposure to the air.

Welde, THOMAS: clergyman; b. in England about 1590; studied at Trinity College, Cambridge; graduated 1613; took orders in the Church of England; was for some years minister of a church at Farling, Essex; being molested as a Puritan by the ecclesiastical authorities, emigrated to New England; arrived at Boston June 5, 1632; was ordained the following month as first minister of the church of Roxbury; received in November as a colleague John Eliot; took part at the trial of Mrs. Anne Hutchinson as an opponent of her peculiar doctrines 1637; was associated with Eliot and Richard Mather in 1639 in making the translation of the Psalms known as the "Bay Psalm-book" (*The Whole Book of Psalms faithfully translated into English Metre*, Cambridge, 1640), which was the first volume printed in New England; was sent with Hugh Peters to England in 1641 as agent for the colony—a post he filled until 1646, when he was dismissed and requested to return, but remained in England; was afterward pastor of a church at Gateshead, near Newcastle-upon-Tyne; accompanied Lord Forbes to Ireland, and resided there some time; subsequently returned to England, and was ejected from his living for nonconformity 1662. D. Mar. 23, 1662. He published *A Short Story of the Rise, Reign, and Ruin of the Antinomians, Familists, and Libertines that infected the Churches of New England* (London, 1644; 2d ed. 1692), a celebrated tract of which another shorter version, *Antinomians and Familists condemned*, etc. (1644), appeared about the same time, leaving it doubtful which is the original edition, and whether Gov. John Winthrop may not have been the chief author, as maintained by several antiquaries. It was answered by Rev. John Wheelwright in his *Mercurius Americanus*, etc. (1645). Revised by S. M. JACKSON.

Welding [cf. Dan. *välde*, boil, gush : Swed. *välla*, weld : Germ. *wellen*, boil, well up, weld]: a term applied to a phenomenon exhibited by iron, platinum, and probably some other metals, consisting in the assumption at a certain temperature of a glutinous cohesion between surfaces, accompanied, in the case of iron, with a considerable degree of plasticity and viscosity. It is doubtful whether this character as manifested in iron differs in nature from the same character as assumed by semi-fused shellac or sealing-wax. It is one of the most important properties, in a practical sense, of both iron and platinum, for without it neither of these valuable metals could be readily or cheaply obtained in large homogeneous masses. The process of puddling iron is founded on the welding cohesiveness produced at the heat of the puddling-hearth as the iron gradually loses its carbon and other contaminating impurities. The tool of the operative causes the particles of iron, as they gradually "come to nature," to cohere together gradually into a ball. The same remark applies to the processes of obtaining soft iron direct from the ore in bloomeries or Catalan forges. Platinum is obtained in masses by forming it into sponge by chemical means, then compressing this into a cylinder, which, when heated highly and hammered, welds into a compact homogeneity. See also ELECTRIC WELDING.
Revised by R. H. THURSTON.

Weldon: town; Halifax co., N. C.; on the Roanoke river, and the Atl. Coast Line and the Seaboard Air Line railways; 80 miles S. of Richmond, Va., and 97 miles E. of Raleigh (for location, see map of North Carolina, ref. 2–I). It is in an agricultural region, with excellent water-power, and has 6 churches, 2 public and 2 private schools, a State bank with capital of $10,000, a weekly newspaper, large winery, and several mills in its vicinity. Pop. (1880) 932; (1890) 1,286; (1900) 1,433. EDITOR OF "ROANOKE NEWS."

Welhaven, *vel-haa'fen*, JOHAN SEBASTIAN CAMMERMEYER: poet; b. at Bergen, Norway, Dec. 22, 1807; studied at the University of Christiania; began to lecture on philosophy in 1840; was appointed professor in 1846. In 1832 he published *Henrik Wergelands Digtekunst og Charakter*, and thereby opened that memorable controversy which forms the introduction to modern Norwegian literature. (See NORWEGIAN LITERATURE.) In 1833 he founded *Vidar*, a weekly paper, which in 1836 was transformed into a daily paper, the *Constitutionelle*, and in 1834 he published the book which became the center of the whole contest, *Norges Dæmring* (Norway's Twilight), a collection of sonnets, in which he attacked with merciless sarcasm the prejudices and narrow tendencies of the awakening national spirit, and unfolded his own wider views and loftier ideas. Another collection of poems, without any polemic tendency, appeared in 1851, and a third in 1863. D. in Christiania, Oct. 21, 1873. His collected works were published in 8 vols. in Copenhagen (1868). Revised by D. K. DODGE.

Welland: river of Ontario, Canada; an affluent of the Niagara, which it joins above the falls after a course of about 60 miles. It forms part of the Welland Canal, which connects Lake Erie with Lake Ontario.

Welland, formerly called *Merrittsville*: post-village; capital of Welland County, Ontario, Canada; on Welland river, Railway, and Canal, and on Canada Southern Railway; 12 miles S. of St. Catharine's (see map of Ontario, ref. 5–E). It has a fine water-power. Pop. (1891) 2,035.

Welland Canal: a canal connecting Lakes Ontario and Erie on the Canadian side of the Niagara river. It was con-

structed in 1833 and enlarged in 1871, the present length being 26¾ miles; number of lift locks, 25; total rise of lockage, 327 feet; size of locks, 270 by 45 feet; width of canal, 100 feet; depth on sills, 14 feet. The total cost up to June 30, 1890, was $27,264,802, and the amount of tolls annually collected on freight, passengers, and vessels is about $220,000. It is open on an average for 241 days in the year.

MANSFIELD MERRIMAN.

Welldon, JAMES EDWARD COWELL: educator and author; b. at Tonbridge, England, Apr. 25, 1854; educated at Eton and at King's College, Cambridge, of which he afterward became a fellow and tutor, and graduated senior classic in 1877. He was made head master of Dulwich College in 1883, and head master of Harrow School in 1885. He is the author of *Sermons preached to Harrow Boys*, *The Spiritual Life and other Sermons*, and of standard translations of Aristotle's *Politics*, *Rhetoric*, and *Nicomachean Ethics*.

Well-drilling or **Well-boring**: the operations by which deep holes of comparatively small diameter are sunk into the earth for the purpose of obtaining water or other substances, such as petroleum or gas. Similar holes are drilled in the search for coal, iron ore, salt, and other minerals, and although in this case water is not the object in view, yet work of this character can properly be considered as well-drilling. The principal feature of well drilling or boring—that which distinguishes it from the digging of ordinary water-wells or the sinking of a shaft of a mine—is that all of the operations are conducted from the surface, the hole being generally from 3 to 6 inches in diameter.

Two distinct methods of well-sinking are commonly included under the terms well-drilling and well-boring, viz., the grinding with pressure, by which a hole is made, and the pounding or shattering of the rocks by a heavy chisel-pointed bar. The two methods and the machinery adapted to their application are represented in their highest development on the one hand by the diamond drill (see BLASTING), and on the other by the rope drill or ordinary oil-well apparatus. The first cuts or bores a hole, either cylindrical or annular, and in any desired direction; the other pounds and shatters a hole by its own weight, descending vertically. The advantages possessed by one over the other result from the foregoing facts; the diamond drill can be made to penetrate any rock hard enough to stay in place, while the percussion drill, more simple in construction and operation, is cheaper, requires labor less skilled, and rapidly pierces the softer, horizontally bedded rocks.

The pounding or percussion drill is in common use for sinking deep wells either for fresh water, brine, petroleum, or gas, while the diamond drill, occasionally employed for this purpose, is of greatest utility in exploring the harder, inclined rocks for coal, iron ore, and the precious metals. Although both, strictly speaking, are mining tools, the latter is more commonly identified with the discovery of metals.

An iron bar tipped with steel drawn to a blunt cutting edge, if repeatedly raised a few inches and dropped upon a rock, cuts a depression. By slightly turning the bar each time it is raised and causing the chisel edge to strike across the mark left by the preceding blow the depression becomes a nearly circular hole. If the bar is repeatedly raised, turned, and let fall the hole deepens until the powdered rock prevents further progress. If water is now put into the hole the rock dust becomes soft mud and can be readily drawn out, allowing the drilling to go on again for a time. This is a common method in use in many quarries. To make a deep well the same principle is employed; the tools are made larger, heavier, and longer, and are generally suspended from ropes. To manipulate these it is necessary to employ machinery more or less complicated, but in all cases the operations are essentially the same as that just described.

The first step in the development of deep-drilling machinery from the simple bar is the use of a spring pole to raise the drill. A small tree of suitable elasticity is cut and trimmed into a long pole, the butt firmly fastened to the ground and the top inclined upward at an angle of about 30 degrees to the horizon. From the tip the drilling-rod is suspended. By pulling the end of the pole down the drill strikes its blow and then is lifted by the tendency of the pole to become straight again. In this way the labor is greatly reduced, since it is far easier to pull down the drilling-rod than to lift it. The mud is removed from the hole by means of a suitable bucket of small diameter or other device lowered and raised when the hole is deep by a rope and windlass. Wells of from 2 to 3 inches in diameter and 100 feet or even more in depth are frequently drilled in this manner, two men working at a time and making a progress of about 15 feet a day, or more or less according to the hardness of the rocks encountered.

The second degree of development is the use of horse-power to raise the drill, suitable devices being employed, such that rotary motion from a treadmill or capstan is converted into a rapid vertical lift and fall. From this it is but a short step to the use of steam-power, by which the largest results are accomplished. With horse-power wells of from 3 to 4 inches in diameter are often drilled to depths of from 100 to 300 feet or more, while with steam depths of 4,000 feet are not rare. By far the greater number of deep wells are now drilled by steam, hand-power and horses being used in putting down shallow wells in localities where machinery is expensive and labor cheap.

Wells, ranging generally from 1,000 to 2,000 feet in depth, are being drilled in the U. S. at the rate of about 300 a month. These are mainly in the oil and gas regions of Pennsylvania, Ohio, and Indiana. The machinery in common use throughout the country for the purpose of deep drilling, whether for water or oil, has been developed and brought to its present state of perfection in these oil-fields, where certain standard sizes and patterns have been adopted after years of trial and change. The various tools, engines, pipes, etc., made in these localities are used not only throughout the U. S., but in foreign countries as well. A description therefore of the apparatus employed in drilling an oil-well applies to the machinery used for probably nine-tenths of the artesian or other deep wells of the U. S.

The most prominent object about a deep-drilling well is the derrick or rig, a framework tower 20 feet square at bottom, tapering to 4 feet at top, and usually 72 feet high. This tower is for the purpose of carrying two pulleys, the crown pulley in the center and the block through which the sand-line runs. Over the crown pulley runs the cable by which the drilling tools are suspended and raised or lowered, while the sand-line is a smaller rope used to draw out the sand-pump or bailer, by which the hole is cleaned at short intervals during the drilling.

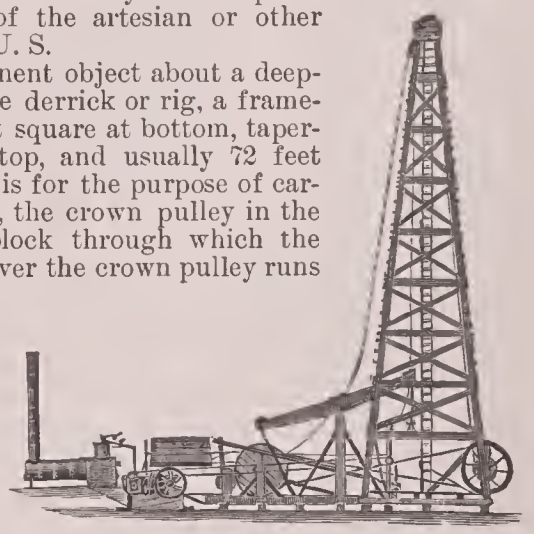


FIG. 1.—Machinery and derrick used in well-drilling: On the extreme left is the boiler for generating steam, and next to it is the engine, above which is a wooden tank for holding water for the boiler. To the right of this, and in the center of the picture, is the band-wheel, and diagonally above this the walking-beam. In the lower part of the derrick, and at the extreme right, are the bull-wheels.

At one side of the rig are the bull-wheels or windlass upon which the cable is wound, and at the other the walking-beam, a heavy timber 20 feet long hung in the center so that it can oscillate up and down. One end comes directly over the hole, and the other can be attached by a pitman to a crank driven by the band-wheel, which in turn is belted to the engine. This large band-wheel can also be made to run the sand-reel or long windlass carrying the sand-line, one end of the reel being drawn when in use by a powerful lever against the band-wheel. The band-wheel imparts motion in a third way, viz., by means of an endless bull-rope turning the bull-wheels which wind or unwind the cable. Without moving from his position on the floor of the derrick, the driller can start, stop, or reverse his engine, run the sand-line or cable in or out of the hole, or control the motion of the walking-beam, and in short, by a few simple mechanical devices can perform all the operations of putting the drilling tools in or out, cleaning the hole, and drilling.

A "string" of drilling tools consists of a bit 4 feet long, weighing 150 lb.; an auger-stem about 40 feet long, and weighing 1,300 lb.; the jars, 6 feet or more long, weighing 300 lb.; the sinker-bar, 16 feet long, weighing 600 lb.; and the rope socket of 75 lb. on top. The total length of the string of tools is 60 feet, and when suspended from the crown pulley by means of the cable, 1⅞ inches in diameter, the tools swing inside the derrick, and when necessary can be stood up out of the way. When in use the tools are lowered into

the hole by means of the bull-wheels, then are raised a few inches, and the rope is securely clamped to the temper-screw hanging to the end of the walking-beam, the rope above the

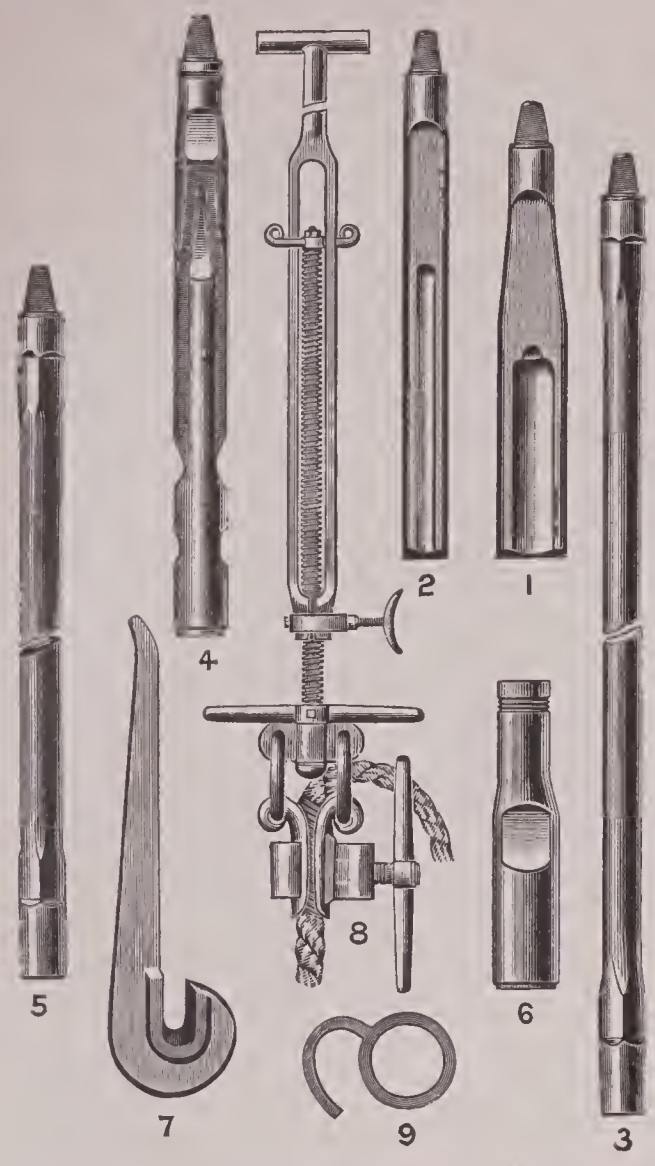


Fig. 2.—Principal drilling tools: 1, 8-inch bit; 2, 5⅝-inch bit; 3, auger-stem; 4, jars; 5, sinker-bar; 6, rope-socket; 7, one of a pair of wrenches used in screwing tools together; 8, drilling cable held by clamps and hung from temper-screw above; 9, gauge used when dressing 8-inch bit.

point of attachment being allowed to hang freely. By means of the temper-screw the tools can be gradually lowered as drilling progresses, the screw running down 5 feet.

The bit or cutting tool is pointed with steel, has an obtuse cutting edge, usually either 8 inches or 5⅝ inches across, according to the size of hole to be made. Bits as large as 12 or even 14 inches across are used in starting the hole in clays or unconsolidated rocks. The auger-stem is to give weight to the bit and efficiency to the blow. The jars consist of two long flat links, faced on the inside with steel, playing into each other and allowing a vertical movement of about 9 inches. They divide the string of tools into two parts, acting in a degree independently of each other. Above the jars is the sinker-bar, whose purpose is to give efficiency to the upward blow of the upper half of the jars. The jars are used mainly to loosen the tools if the lower part becomes wedged or stuck in the hole. In such cases a direct pull is of little effect and may result in breaking the cable, while a series of sharp upward blows given by the rapid pulling open of the links of the jars generally starts the wedged tools. The jars are not made for giving a downward blow, and may be broken if thus used.

After drilling has progressed the length of a "screw"—viz., 5 feet—the tools are hoisted out, and water thrown in if the hole is dry. The sand-pump or bailer, a tube 16 feet or more long with a valve in the bottom, is then run in on the end of the sand-line, and when full of mud and water is drawn out and emptied, the operation being repeated until the hole is free from mud. Then a new bit, sharpened and of full width, is put on the end of the tools; they are run in, and drilling goes on again. The rope is constantly turned at the surface, first in one direction and then in the other, thus causing the bit slowly to revolve and cut a round hole. Drilling and sand-pumping alternate with each other as rapidly as possible, the operations continuing day and night by twelve-hour shifts until the work is done.

In Canada and a few localities in the U. S. drilling is done by means of wooden rods instead of a rope. These extend from the jars to the top of the hole, being screwed together end to end by iron joints. There are certain advantages, in that the tools are under better control, but the time consumed in unjointing a long string of rods and putting them together again each time the drill is changed is a serious drawback, and there is always danger of breaking or unscrewing the rods when in use.

It is necessary that at least the upper part of the well, where the rocks are soft or unconsolidated, be lined with casing. This not only keeps the walls from falling in, but also, if properly set, keeps out surface or other waters. It is usual to drill the hole as rapidly as possible, and then slip the casing in, its diameter being less than that of the drill. Sometimes this can not be done on account of the instability of the walls, and then it is necessary to adopt some modification, as, for instance, drilling ahead a short distance, and then driving the casing down. The devices employed to overcome difficulties of this kind are very numerous, each being adapted to a special need. The casing is usually of wrought iron, put together by means of screw joints and collars, and will stand a pressure of from 1,000 to 3,000 lb. per square inch. Near the top of the well sometimes as much as 100 feet or more of large wooden casing is used. This not being water-tight serves merely to keep loose earth from falling in. Some of the shallower wells have been cased with spirally jointed sheet-iron casing, but this has not always been satisfactory on account of the difficulty of making tight joints.

The cost of drilling varies greatly according to the locality and character of rock penetrated. The minimum is in the oil regions, where hundreds of wells are being drilled, and where manufactories of tools are near at hand. Away from these headquarters the cost may be two, three, or even four times as much. Under the most favorable circumstances a 1,500-foot well can be drilled and cased through surface rocks for $2,000, and one 2,000 feet deep for $2,300. Usually, however, the expenses will be far greater. Wells of from 500 to 1,000 feet in depth are relatively more expensive than those of from 1,200 to 2,000 feet, since the cost of preparation is about the same in all cases. The total outlay may be from $1,200 to $1,800. Also holes of great depth—of 3,000 feet and upward—are more costly in proportion to the depth, as the machinery and tools must be larger and heavier. In the western part of the U. S. the contract cost of completing artesian wells to depths of 1,000 feet or more is as high as $4 or even $5 per foot.

Owing to the small size of the hole and the great depths at which work is done, there is constant danger of delay or obstruction by accidents to the drilling tools. These may be deflected by cross bedding of the rocks or by jointing planes, and the hole must be straightened before they can do effective work; or they may become wedged by bits of rock falling in, or by the new bit sticking in the bottom of the hole made by the old worn bit so that it can not be jarred loose. A more serious matter, however, is where the tools or rope break, leaving a mass of iron and steel to be removed. All of these and other mishaps are usually successfully overcome by the use of innumerable ingenious devices. Almost anything from a bolt to a complete string of tools and rope can be recovered from a hole by the use of proper "fishing tools." These are designed to grasp objects, either of rope, wood, or metal, and to tighten their hold as they are withdrawn. Rope can be cut by an arrangement of knife-edges, and the smooth ends of broken tools can be caught by "slip-sockets," whose grip is so tenacious that jarring may go on for hours. All of this work often takes place in a hole 5⅝ inches in diameter and from 1,000 to 2,000 feet or more below the surface. F. H. Newell.

Welles, Gideon: cabinet officer; b. at Glastonbury, Conn., July 1, 1802; educated at Norwich University, Vt.; studied law; was editor and proprietor of the Hartford *Times*, a Democratic paper, 1826–36, and continued to contribute to its editorial columns till 1854; supported the candidacy of Gen. Jackson for the presidency; was a member of the State Legislature 1827–35; was chosen State comptroller in 1835, and was elected to that office in 1842 and 1843, having in the meanwhile been for several years postmaster of Hartford. From 1846 to 1849 he was chief of a bureau in the U. S. Navy Department. He was an original member of the

Republican party, and as chairman of the Connecticut delegation at the Chicago convention was influential in securing the nomination of Lincoln for the presidency; was Secretary of the Navy through the administrations of Lincoln and Johnson, and through his energy the strength and efficiency of the navy were greatly increased, though at such great expense as to provoke hostile criticism. He was identified with several important reform movements, notably the agitation for the abolition of imprisonment for debt, and was pronounced in his anti-slavery views. D. in Hartford, Conn., Feb. 11, 1878. Revised by F. M. COLBY.

Wellesley, welz'lĕe: town (incorporated in 1881); Norfolk co., Mass.; on the Boston and Albany Railroad; 3 miles E. of Natick, 15 miles W. by S. of Boston (for location, see map of Massachusetts, ref. 5–I). It contains the villages of Wellesley, Wellesley Hills, Wellesley Farms, Wellesley Falls, and Unionville; is the seat of WELLESLEY COLLEGE (*q. v.*); and has 4 churches, high school (new building cost $40,000), 13 district schools, Dana Hall, several private schools, waterworks, electric lights, electric railway to Natick and Newton, 2 hotels, and a weekly and a monthly periodical. The town also contains the celebrated Italian gardens of H. H. Hunnewell, who has presented the town with a fine hall, a park of 10 acres, and a public library with 10,000 volumes. In 1894 Wellesley had an assessed valuation of $7,500,000 and a debt of $100,000. Pop. (1885) 3,013; (1890) 3,600; (1900) 5,072. EDITOR OF "COURANT."

Wellesley, ARTHUR: See WELLINGTON.

Wellesley, RICHARD COLLEY, Marquis Wellesley, K. G., D. C. L., and Earl of Mornington: soldier and statesman; brother of the first Duke of Wellington; b. at Dublin, Ireland, June 20, 1760; educated at Oxford; succeeded to the titles of Viscount Wellesley and Earl of Mornington, and took his seat in the Irish House of Peers; was elected to the British House of Commons for Beeralston 1785, and for Saltash 1786, but was unseated in the latter year; advocated in the Irish Parliament, during the regency debate of 1789, the restriction of the powers of the prince during the malady of the king; became, in consequence, a favorite of George III.; obtained an election from Windsor; was made one of the Lords of the Treasury; was raised to the House of Lords as Baron Wellesley, and appointed Governor-General of India Oct. 4, 1797; arrived at Calcutta May, 1798; found the native powers of India ripe for a struggle against the British rule; sent a small British force into the territories of the nizam, ordering him to disband his levies and to surrender 124 French officers; dispatched an army under Gen. Harris against the capital of Mysore Feb. 3, 1799, coming himself to Madras to superintend the operations, which resulted in the storming of Seringapatam May 4; divided the territories of Mysore with the nizam, and made his brother, Col. Arthur Wellesley, governor of Seringapatam July, 1799; was created Marquis Wellesley in the peerage of Ireland Dec. 2, 1799; received the thanks of Parliament, and refused £100,000 of prize-money offered by the East India Company; directed his attention with success to the commercial interests and the internal organization of the British Empire in India; sent in 1801 a force of 7,000 men up the Red Sea against the French in Egypt; had a quarrel with the board of directors and tendered his resignation 1802, but was induced to withdraw it; engaged in a desperate but victorious struggle with the Mahrattas 1803–05; founded a college for the cultivation of Indian literature; inaugurated surveys of the country and effected great financial reforms, making his administration the most memorable in Anglo-Indian history; returned to England Aug., 1805; was received with honor by the Government and the East India Company, which conferred upon him an annuity of £5,000; was ambassador in Spain 1808–09; Secretary of State from Dec., 1809, to Jan., 1812; was designated as Prime Minister in May, 1812, but was unable to form a cabinet; rendered invaluable parliamentary support to his brother during the campaigns of the Peninsula and of Waterloo; accepted the office of Lord-Lieutenant of Ireland Dec., 1821; was recalled on the accession of his brother to the premiership, 1828, owing to a difference of opinion between them on the "Catholic question"; and was lord chamberlain 1835, but resigned from public life the same year on account of advanced age and straitened circumstances, and was the recipient of a testimonial of £20,000 from the East India Company. D. at Kingston House, Knightsbridge, London, Sept. 26, 1842, and was buried in the vault at Eton College chapel. Statues have been erected in London and at Calcutta. He published several political pamphlets shortly before his death, and privately printed a small volume of poems in English, Latin, and Greek, entitled *Primitiæ et Reliquiæ* (1840; 2d issue 1841). His *Dispatches, Minutes, and Correspondence, etc.*, during his administration in India (5 vols., 1836–37), and his *Despatches and Correspondence* during his mission to Spain (1838), were edited by R. Montgomery Martin, and his *Memoirs and Correspondence* (3 vols., 1846) by Robert R. Pearce. Revised by F. M. COLBY.

Wellesley College: an institution of learning devoted exclusively to the higher education of women; in the village of Wellesley, on Lake Waban, about 15 miles from Boston. The grounds comprise 300 acres, and for many years before the establishment of the college had been cultivated as a gentleman's country-seat. The main building is 475 feet long and five stories high. It is of brick trimmed with freestone. Since the opening of the college in 1875 three buildings for purposes of instruction have been added: the school of music in 1881, the Farnsworth school of art in 1889, and the chemistry building in 1894; also Stone Hall and 8 cottages for dormitories. The college is chartered by the State, and empowered to confer all collegiate and honorary degrees that are conferred by any Massachusetts college or university. There were in 1900 715 students and 69 teachers and other officers. Miss Caroline Hazard is the president. The standard of study is the same as that of the foremost colleges for young men. The library contains 50,000 volumes; the apparatus, cabinets, and laboratories are extensive.

Wellfleet: town (incorporated in 1763); Barnstable co., Mass.; on the N. Y., N. H., and Hart. Railroad; 14 miles S. E. of Provincetown (for location, see map of Massachusetts, ref. 4–K). It contains the villages of Wellfleet and South Wellfleet; has a Methodist Episcopal church, public high school, five district schools, and a public library; and is principally engaged in fishing. In 1894 it had an assessed property valuation of $611,063. Pop. (1880) 1,875; (1890) 1,291; (1900) 988.

Wellhausen, vel'how-zen, JULIUS: biblical critic; b. at Hameln-on-the-Weser, Germany, May 17, 1844; studied at Göttingen under Ewald 1862–65; became privat docent there in the theological faculty 1870; Ordinary Professor of Theology at Greifswald 1872; changed to the philosophical faculty at Halle 1882, because he was convinced that he was no longer even a Protestant; went in the same capacity to Marburg 1885, and to Göttingen 1892. He is a leader in the school of Old Testament criticism which denies historical value to the supernatural element in the Old Testament, and indeed sees nothing in the book but literature, whose authorship and date, consequently, are in general not those traditionally assigned to them. (See HEXATEUCH.) His principal works are *Der Text der Bücher Samuelis* (Göttingen, 1871); *Pharisäer und Sadducäer* (Greifswald, 1874); *Prolegomena zur Geschichte Israels* (Berlin, 1878; 4th ed. 1895; Eng. trans., *History of Israel*, Edinburgh and London, 1885); *Muhammed in Medina. Das ist Vakidis Kitab al Maghazi, in verkürzter deutschen Wiedergabe herausgegeben* (Berlin, 1882); *Skizzen und Vorarbeiten* (1884–92); *Die Composition des Hexateuchs und der historischen Bücher des Alten Testaments* (2d ed. 1889); *Israelitische und Jüdische Geschichte* (1894). SAMUEL MACAULEY JACKSON.

Welling, JAMES CLARKE, LL. D.: educator and editor; b. at Trenton, N. J., July 14, 1825; graduated at Princeton College 1844; became associate principal of the New York Collegiate School 1848; editor of *The National Intelligencer*, Washington, D. C., 1856–65; clerk of U. S. court of claims 1862–67; president of St. John's College, Annapolis, Md., 1867–70; Professor of Belles-Lettres in Princeton College 1870–71; president of Columbian University 1871–94. He also was president of the Philosophical Society of Washington, president of the Anthropological Society, regent of Smithsonian Institution, and chairman of the executive committee and president of the Corcoran Gallery of Art. D. at Hartford, Conn., Sept. 4, 1894. W. H. WHITSITT.

Wel'lington: capital of New Zealand; on an inlet of Cook's Strait, on the west shore of Port Nicholson. It is well built, has an excellent harbor, and is connected by railway with Auckland. It carries on a considerable trade, exporting wool, tallow, and gum. It was founded in 1840, and became capital of the colony in 1865. Pop. (1891) 31,021; (1896) 41,758. M. W. H.

Wellington: city; capital of Sumner co., Kan.; on the Slate creek, and the Atch., Top. and S. Fé, and the Chi., Rock Id. and Pac. railways; 29 miles S. of Wichita, 270 miles S. W. of Kansas City (for location, see map of Kansas, ref. 8–G). It is in an agricultural region; has 3 national banks, combined capital $200,000, a private bank, 2 loan and investment companies, public high school, and a daily and 3 weekly newspapers. Pop. (1880) 2,694; (1890) 4,391; (1900) 4,245.

Wellington: village; Lorain co., O.; on the Cleve., Cin., Chi. and St. L. and the Wheeling and Lake Erie railways; 10 miles S. of Auburn, 36 miles S. W. of Cleveland (for location, see map of Ohio, ref. 2–G). It is one of the principal markets for dairy products in Ohio, the shipment of cheese alone amounting to 6,000,000 lb. annually. It has 5 churches, public school with 10 departments, a national bank with capital of $100,000, 2 weekly newspapers, foundry, bending-works, flour-mills, and common lumber and hardwood mills. Pop. (1880) 1,811; (1890) 2,069; (1900) 2,094.

EDITOR OF "ENTERPRISE."

Wellington, ARTHUR MELLEN: civil engineer; b. at Waltham, Mass., Dec. 20, 1847; was educated at the Boston Latin School, and later was an engineering student in the office of John B. Henck. From 1867 to 1885 he was in active engineering practice and chief engineer of the location and construction of several railways. He located the difficult railway line from Vera Cruz to the city of Mexico. In 1887 he became editor of *Engineering News*, New York. He published *Computation of Earthwork* (New York, 1874); *Economic Theory of Railway Location* (New York, 1876; greatly enlarged edition 1887): and edited the *Car-Builder's Dictionary* (1884). D. in New York, May 16, 1895. M. M.

Wellington, ARTHUR WELLESLEY, K. G., Duke of: soldier; b. at Dangan Castle, County Meath, Ireland, May 1, 1769; was the third son of Garrett Wellesley, first Viscount Wellesley and Earl of Mornington (d. 1781), who attained some distinction as a musical composer, and of Anne Hill Trevor, eldest daughter of Arthur, first Viscount Dungannon. He received his earlier education at Eton College, after which he spent six years in the military seminary at Angers, France, then under the direction of the celebrated engineer Pignerol. Having entered the army as ensign Mar. 7, 1787, he was rapidly pushed by family influence through the lower grades of the service, and on Sept. 30, 1793, attained the rank of lieutenant-colonel of the Thirty-third Foot. In the meanwhile, in the summer of 1790, he had been elected to the Irish Parliament for the borough of Trim, where his family possessed preponderating influence, and in the following year he was appointed aide-de-camp to the Earl of Westmoreland, Lord-Lieutenant of Ireland. He saw his first field-service under the Duke of York in the Netherlands in 1794, when, having obtained through his brother's influence the command of the Thirty-third regiment, he embarked at Cork for Ostend; joined the main body of the army at Antwerp, and commanded three battalions during the disastrous retreat of the British army through Holland Jan., 1795, conducting himself with credit in several skirmishes with the French. Having been commissioned colonel in May, 1796, he embarked for India with his regiment in the same year, arriving at Calcutta Feb., 1797, and was placed in command of the subsidiary forces furnished by the nizam for the campaign against Tippu Sultan 1799. In the victory of Malvalli he bore a prominent part, and on May 4 commanded the reserves in the trenches at the assault and capture of Seringapatam. Having been appointed governor of Mysore by his brother, the governor-general (see WELLESLEY, RICHARD COLLEY), he waged a campaign against a celebrated Mahratta freebooter, Dhundia Wagh, self-styled the king of the two worlds, whom he defeated and killed Sept. 10, 1800. He was named second in command to the expedition sent to Egypt 1801, but was prevented by illness from embarking. Appointed major-general in Apr., 1802, he commanded the expedition against the Mahrattas, and restored the Peshwa Apr.–May, 1803; besieged and took Ahmadnagar Aug. 8–12; entered Aurungabad Aug. 29: defeated Sindhia at the decisive battle of Assaye Sept. 23, and again at Argaum Nov. 29; took the great fort of Gawilghar in December, and concluded a treaty with Sindhia Dec. 30, imposing upon him stringent conditions. For these services he was knighted and received the thanks of the king and Parliament 1804. In Nov., 1805, he took part in Lord Catheart's expedition to Hanover. He married Lady Catharine Pakenham, second daughter of the third Earl of Longford, Apr. 10, 1806, and was soon afterward elected to the British Parliament for Newport, Isle of Wight. In Apr., 1807, he became Chief Secretary for Ireland under the Duke of Richmond. Holding a command under Lord Cathcart, he took part in the expedition against Copenhagen, and negotiated the capitulation of that city Sept. 7, 1807. In the summer of 1808 he was made commander-in-chief of the forces sent to the Peninsula, and having landed at Corunna in July, offered his aid to the Galicians for the expulsion of the French, but the offer being declined, he re-embarked; landed at Mondego Bay, Portugal, Aug. 1, and defeated Gen. Laborde at Roliça Aug. 17. On Aug. 20, 1808, he was superseded in the chief command by Sir Harry Burrard, but on the following day gained over Junot the brilliant victory of Vimeira, which again won him the thanks of Parliament. On Aug. 31 he signed the armistice which led to the convention of Cintra. Returning to England at the end of the year, he resumed his seat in Parliament Jan., 1809, but again took the field in the following spring, having been placed in the chief command of the Peninsula forces on the death of Sir John Moore. Passing the Douro in the face of the French army, he entered Oporto May 12, and was appointed by the prince regent marshal-general of the Portuguese army in the same month. On July 27–28 he defeated the French under Marshals Victor and Sebastiani in the battle of Talavera, but was compelled by the non-co-operation of the Spanish army to fall back on Badajoz, crossing the Tagus at Arzobispo Aug. 4. For the third time he received the thanks of Parliament, and was further rewarded by being created Baron Douro of Wellesley and Viscount Wellington of Talavera with a pension of £2,000 Sept. 4, 1809. He now fortified his famous triple lines of intrenchments, 30 miles in length, between the Tagus and the Atlantic, at TORRES VEDRAS (*q. v.*). Having repulsed Masséna at Busaco Sept. 27, 1810, he again occupied the lines of Torres Vedras Oct. 10. On Apr. 11, 1811, he received the thanks of Parliament for the liberation of Portugal. In the following month he gained the victory of Fuentes de Onoro, took Almeida, and invested Badajoz, but retreated on June 10 within the frontiers of Portugal. He carried Ciudad Rodrigo by assault Jan. 19, 1812, for which he was made by the Spanish regency Duke of Ciudad Rodrigo and a grandee of Spain, and by his own government created Earl of Wellington with a further pension of £2,000. Having taken Badajoz by storm Apr. 6, routed Marmont with great slaughter at Salamanca July 22, and occupied Madrid Aug. 12, he was made generalissimo of the Spanish armies, created Marquis of Wellington Oct. 3, and granted £100,000 by Parliament. In the spring of 1813 he entered Spain with 200,000 men in two columns; obtained a signal victory over King Joseph and Jourdan at Vitoria June 21, capturing 150 cannon and driving the French into the Pyrenees. On July 3 he was made field-marshal of Great Britain and Duke of Vitoria in Spain. Siege was now laid to San Sebastian and Pamplona, but at first without success. From July 27 to 31 Wellington gained a series of battles in the Pyrenees. On Aug. 31 he took San Sebastian by assault, and early in October crossed the river Bidassoa into France. Pamplona capitulated on Oct. 31, after which he took up his headquarters at St. Jean de Luz. On Dec. 10–18 he repulsed Soult, and leaving two divisions to blockade Bayonne pursued him and defeated him at Orthez Feb. 27, 1814, and at Toulouse Apr. 10, occupying the latter place two days later. Learning of the occupation of Paris he went thither, and from there to London, where he arrived on June 23, having in the meanwhile been made Marquis of Douro and Duke of Wellington (May 11). In August he went to Paris as ambassador to the restored monarch, Louis XVIII., attended the Congress of Vienna Jan., 1815, and took command of the British army in Flanders in April on the return of Napoleon from Elba. He repulsed Ney at Quatre Bras June 16, and two days later gained, with the Prussian marshal Blücher, the decisive battle of WATERLOO (*q. v.*), after which he crossed the French frontier and marched upon Paris June 21. From 1815 to 1818 he was commander-in-chief of the allied army of occupation in France. For his services in the campaign he was richly rewarded. Sixty thousand pounds were awarded to him as Waterloo prize-money. The King of the Netherlands bestowed on him the title of Prince of Waterloo, and the British nation presented him with the valuable estate of Strathfieldsaye, Hampshire. He attended the Congress of Aix-la-Chapelle for the evacuation of France (1818), and in the same year was created field-marshal of Austria, Russia, and Prussia. Through his appointment as master-general of the ordnance, Jan. 1, 1819, he secured a seat in the British

cabinet. He attended the Congress of Verona in 1822, and was afterward ambassador to Russia. From Jan. 8, 1828, to Nov. 15, 1830, he was Prime Minister in the Tory interest, steadily opposing Roman Catholic emancipation and all projects of parliamentary reform, on which account he was hooted in the streets of London, the windows of Apsley House were broken by the mob, and an attempt was made to burn his country residence June, 1832. On Jan. 29, 1834, he was appointed chancellor of Oxford University. He was Secretary of State for Foreign Affairs from Dec., 1834, to Apr. 8, 1835, and in 1841 he was a member of the cabinet without a portfolio. He gave a reluctant support to the free-trade measures of Sir Robert Peel. He was president of the privy council 1845–46, after which he declined further political honors on account of advanced age, though he continued to attend the House of Lords and was assiduous in the discharge of his duties at the court of the youthful Queen. He died of apoplexy at Walmer Castle, Kent, his official residence, as lord warden of Cinque Ports, Sept. 22, 1852; received a magnificent funeral, and was buried near the tomb of Nelson in the crypt of St. Paul's Cathedral, London, Nov. 9. In person he was of middle size, but strongly built, and his capacity for enduring fatigue gave him the familiar title of "the Iron Duke." His leading characteristics as a soldier were invincible resolution and singleness of purpose, combined with a full measure of caution. His political, social, religious, and literary instincts were pre-eminently conservative—a fact which brought him into unpopularity during the agitations for reform, but did not detract from the affectionate pride and veneration with which he was regarded by his countrymen during the protracted evening of his life. Numerous statues and memorials have been erected to his memory, and works illustrative of his military exploits are naturally abundant. The most notable personal biographies are those of Maxwell (3 vols., 1839–41), Stocqueler (2 vols., 1852–53), Brialmont (3 vols., 1856–57), Yonge (2 vols., 1860), and Hooper (1 vol., 1889). His *Dispatches* (33 vols. 8vo, 1852–80) and his *Supplementary Dispatches and Memoranda*, the first eight volumes edited by Col. John Gurwood, the others by his son Arthur Richard, the second duke (1807–84), exhibit him in a most favorable light, and constitute invaluable materials for history. The present duke, who was born in 1846, is the eldest son of Lord Charles Wellesley, the Duke of Wellington's second son, who succeeded his childless uncle in Aug., 1884. Revised by JAMES GRANT WILSON.

Wellingto'nia gigan'tea: the name under which the *Sequoia gigantea* was first made known to the world. See SEQUOIA.

Wellington Island: See MAGALLANES.

Wells [M. Eng. *welle* < O. Eng. *wella*, *wylla*, deriv. of *weallan*, well up, surge, boil: Germ. *wellen*. Cf. WELDING]: a term which was originally applied to natural flowing springs, but which has come to designate artificial excavations or shafts sunk in the ground to obtain supplies of water.

Living springs were the only sources of drinkable water known to primitive man, and the construction of excavated wells dates from a time when social institutions were so far organized as to secure to individuals, or at least families or tribes, long enjoyment of the fields and the pastures of which they had taken possession. In Persia, at the present time, he who sinks a well in waste lands becomes the proprietor of the land irrigated by its waters, and it is supposed that this was the case in Palestine in ancient days, and that this accounts for the opposition encountered by Abraham and by Isaac in holding or digging wells (Gen. xxi., xxvi.). In pastoral life, and especially in the climates in which pastoral industry appears to have been first largely practiced, water is the first requisite for the establishment of a camp or the temporary occupancy of feeding-grounds for cattle. The nomad Bedouins now rarely if ever dig wells. For their small herds the slender threads of living water found here and there in the desert, cisterns and pools accumulated from the winter rains, suffice, and in many of their habitual routes of travel they still find a supply of water in wells excavated, like those of Jacob and of Beersheba, in the patriarchal ages. Ancient writers speak of wells in the North African desert several hundred feet deep, and their accounts have been confirmed by modern travelers; but in a large part of that waste a continuous sheet of water exists at depths so moderate as to be easily reached by cutting through the bed of indurated sand which overlies it. The wells of the Sahara are square excavations, not walled up with stone, but lined with a framework of palm-trunks, and they yield an abundant supply of water for cattle and for irrigating the small gardens which Arab industry finds it convenient to till. The water often rises to the surface and pours over like that in an artesian boring, and the wells are choked in a few years by fine sand brought up by the flow. The removal of the sand is a difficult and dangerous operation, as the work must be performed under water, and it is the special vocation of a sort of guild or corporation.

In the East wells are generally round, and when not cut through solid rock are generally stoned, as in Europe. In their present condition they are usually without a curb, the orifice being closed by a flat stone, and they are unprovided with any apparatus for raising the water, the traveler being expected to furnish his own rope and bucket. In ancient times, as is apparent from the Scriptures (e. g. Gen. xxiv. 16–20), access to the water of some wells was had by descending steps, and the water was dipped out with a vessel. The Greek and Roman wells were provided with curbs, and it appears that these were used long before the general employment of sweeps or of pulleys for hoisting the bucket, for the edges of the most ancient curbs are everywhere cut into channels by the friction of the rope drawn over them, which would not be the case if the water-vessels had been attached to a sweep or to a rope passing over a pulley suspended from above. The *shadoof*, a rude structure resembling a well-sweep, is commonly used in the East to raise water from wells, reservoirs, and rivers.

The economical and sanitary value of water, and the frequent difficulty and expense of procuring it, gave wells great importance in the eyes of the ancient world, and those distinguished for purity or abundance of water were regarded with almost idolatrous reverence. Hence great care was bestowed upon their construction and preservation, and they were often sumptuously decorated and provided with many useful as well as ornamental accessories. Many ancient well-curbs of fine material and workmanship are found in museums of ancient art, and some of those in the Vatican—particularly one of marble, thought to be Etruscan—are among the most admirable works of sculpture in that great museum. In India, too, valuable wells are considered and treated almost as temples. Of remarkable wells mention may be made of that in the citadel at Cairo, traditionally ascribed to the patriarch Joseph. This is several hundred feet in depth, and is surrounded by a double winding ramp by which beasts of burden can descend and bring up water. There is a very similar well, though not of very ancient construction, at Orvieto.

In many parts of Europe, centuries after the introduction of Christianity, wells were believed to possess miraculous powers, and were resorted to by those who desired to avert misfortunes, to win the affection of others, or to bring calamity upon enemies, the end being gained by application of the water, often accompanied with the recital of a prayer or formula, or by casting pins, pebbles, or other articles into the wells. "Wishing wells" and "cursing wells" are not uncommon in Great Britain.

The ingenious and simple method of obtaining water by driving a small iron tube, provided with a perforated hollow conical point of steel, a few feet into the ground and applying a hand-pump to the orifice, deserves special notice as an economical and speedy process which in many cases obviates the necessity of common wells altogether. See WATER, ARTESIAN WELLS, WELL-DRILLING, etc.

Wells: an old city, and a municipal and parliamentary borough in Somersetshire, England; 20 miles S. W. of Bath (see map of England, ref. 13–G). It is said to have received its name from St. Andrew's Well, which from its abundant sources sends small rivulets of running water through all the principal streets. The city is the see of a bishop. The cathedral was begun in 704, but much enlarged in 1138. It has a central tower 178 feet high, and its interior is richly decorated. Its western façade is ornamented with 300 statues. The bishop's palace was founded 1088, and is surrounded with high walls and a moat. Pop. (1891) 4,822.

Wells: town (settled about 1640, incorporated in 1653); York co., Me.; on the Boston and Maine R. R.; 28 miles S. W. of Portland (for location, see map of Maine, ref. 11–A). It contains the villages of Wells, Wells Depot, Wells Branch, Ogunquit, Webhannet, and Maryland Ridge, and has 7 churches, 2 public libraries, 5 summer hotels, and lumber, shingle, and grist mills. Pop. (1880) 2,450; (1890) 2,029; (1900) 2,007.

Wells: village; Faribault co., Minn.; on the Chi., Mil. and St. P. Railway; 20 miles N. W. of Albert Lea, 38 miles

S. of Mankato (for location, see map of Minnesota, ref. 11–E). It is in an agricultural region, and has 9 churches, 2 public school buildings, railway repair-shops, 8 grain elevators, a 300-bbl. flour mill, large creamery interests, a national bank with capital of $50,000, a State bank with capital of $25,000, a private bank, and two weekly newspapers. Pop. (1880) 661; (1890) 1,208; (1900) 2,017. EDITOR OF "ADVOCATE."

Wells, DAVID AMES: economist; b. at Springfield, Mass., June 17, 1828; graduated at Williams College 1847, and at Lawrence Scientific School, Cambridge, 1851; assistant professor there 1851–52; was associated with Dr. A. A. Hayes as a chemist at Boston 1853–55; patented in 1856 several improvements in bleaching; was a member of a publishing-house in New York 1857–58; settled at Norwich, Conn.; visited Europe on commissions of the U. S. Government 1862 and 1867; was U. S. special commissioner of the revenue 1866–70; produced on that subject fifteen important reports; became university lecturer on political economy at Yale College 1872; visited Europe 1873; delivered in that year an address before the Cobden Club in London; was chosen a foreign associate of the French Academy of Political Sciences, in the place of John Stuart Mill, deceased, 1874; had been since 1867 a strong advocate of free trade; had taken considerable part in the efforts for civil-service reform, and was an unsuccessful Democratic candidate for Congress at the special election of Apr., 1876. He edited, among other works, the *Annual of Scientific Discovery* (Boston, 16 vols., 1850–65). Among his earlier writings are *Familiar Science* (1856); *The Science of Common Things* (1857); *Elements of Natural Philosophy* (1857); *Principles and Applications of Chemistry* (1858); *First Principles of Geology* (1861); and the extensively circulated political pamphlet *Our Burden and our Strength* (1864). He was a voluminous writer on financial and economic subjects. In this class of his writings may be mentioned *The Creed of the Free-Trader* (1875); *Production and Distribution of Wealth* (1875); *Robinson Crusoe's Money* (1876); *The Silver Question, or the Dollar of the Fathers vs. the Dollar of the Sons* (1878); *Our Merchant Marine, etc.* (1882); *A Primer of Tariff Reform* (1884); *Practical Economics* (1886); *A Study of Mexico* (1887); *A Short and Simple Catechism* (1888); and *Relation of the Tariff to Wages* (1888). D. in Norwich, Conn., Nov. 5, 1898. Revised by F. M. COLBY.

Wells, HORACE: dentist; b. at Hartford, Windsor co., Vt., Jan. 21, 1815; studied dentistry in Boston, and in 1836 began the practice of his profession in Hartford, Conn. As early as 1840 he expressed his belief that nitrous oxide could be used to prevent the pain of dental and other operations, and four years later he publicly demonstrated its efficacy as an anæsthetic. From this time on he daily extracted teeth under the influence of the gas, and other dentists in Hartford adopted the same practice with like success. Early in 1845 Wells went to Boston and communicated his discovery to Dr. W. T. G. Morton, his former pupil and partner, and to Dr. Charles T. Jackson, and others. At a lecture afterward given before the class at the medical college his experiment failed through the carelessness of the operator. Wells was hooted at and hissed out of the amphitheater by the students, and he was pronounced a charlatan and his anæsthetic a humbug. On Oct. 27, 1846, Jackson and Morton published to the world, by letters patent, the discovery of *letheon* as an anæsthetic, but this was seen at once to be nothing but pure sulphuric ether. Each claimed the honor of discovering anæsthesia by ether; but while they were sending bulletins to the Institute of France Wells sailed for Europe, in Dec., 1846, to lay his claims before that body as the real discoverer of anæsthesia. His mission was a failure, and he returned in Mar., 1847. Notwithstanding the successful use of nitrous oxide in Hartford as an anæsthetic in such important operations as the amputation of the thigh and the exsection of tumors, it was nevertheless supplanted by ether, and Wells's claim to the discovery of anæsthesia was unrecognized. Later he went to New York to lay his claims before the profession of the great metropolis. Soon after his arrival he showed signs of mental aberration, and on Jan. 14, 1848, in a fit of madness, he ended his life with his own hands. He was author of the pamphlet *A History of the Application of Nitrous Oxide Gas, Ether, and other Vapors to Surgical Operations* (1847). A bronze statue of him stands in Bushnell Park, Hartford. He ranks as an independent discoverer of the principle of anæsthesia, for his claim antedates all but that of CRAWFORD W. LONG (*q. v.*), who did not publish his discovery till 1849.

Wells, WILLIAM CHARLES, M. D., F. R. S.: scientist; b. at Charleston, S. C., in May, 1757; educated at Dumfries and at Edinburgh, Scotland; studied medicine at Charleston; was a surgeon in the British service in Holland; returned to Charleston early in 1781; practiced medicine there, and became a printer, bookseller, and merchant; went with the loyal troops to St. Augustine, Fla., Dec., 1782; published there the first weekly newspaper in that province, and was captain of loyal volunteers; went to England May, 1784; settled in London 1785; became physician to the Finsbury Dispensary 1790, and to St. Thomas's Hospital 1798; published his *Essay on Single Vision with Two Eyes* (1792) and his celebrated *Essay on Dew* (1814), for which he was awarded the gold and silver Rumford medals by the Royal Society 1816. Darwin states that in a paper read before the Royal Society in 1813 Wells recognized distinctly the principle of natural selection. D. in London, Sept. 18, 1817. His *Autobiography* was published in 1818, and a new edition of his *Essay on Dew* appeared in 1866.

Wellsboro: borough; capital of Tioga co., Pa.; on the Fall Brook Railway; 81 miles N. of Williamsport (for location, see map of Pennsylvania, ref. 2–F). It is in an agricultural and mining region, and has 2 national banks with combined capital of $150,000, 3 weekly newspapers, several saw and planing mills, tanneries, carriage-factories, and marble-works. Pop. (1880) 2,228; (1890) 2,961; (1900) 2,954. EDITOR OF "ADVOCATE."

Wellsburg: city (founded in 1790); capital of Brooke co., W. Va.; on the Ohio river, and the Pitts., Cin., Chi. and St. L. Railway; 16 miles N. of Wheeling (for location, see map of West Virginia, ref. 3–G). It is in an agricultural and wool-growing region, with natural gas and extensive coal mines in its vicinity, and has new city buildings, large public school, a national bank with capital of $100,000, 2 private banks, a weekly newspaper, 7 glass-factories, 2 paper-mills, a sack-factory, and several cigar-factories. Pop. (1890) 2,235; (1900) 2,588. EDITOR OF "PAN-HANDLE NEWS."

Wellston: city (founded in 1876); Jackson co., O.; on the Balt. and O. S. W., the Cin., Ham. and Day., and the Ohio S. railways; 10 miles N. of Jackson, the county-seat, and 35 miles S. E. of Chillicothe (for location, see map of Ohio, ref. 7–F). It is in a coal-mining region, and has 12 churches, 5 public-school buildings, several iron-foundries, machine-works, and mills, a national bank with capital of $50,000, and 2 weekly newspapers. Pop. (1880) 952; (1890) 4,377; (1900) 8,045. EDITOR OF "SENTINEL."

Wellsville: city; Montgomery co., Mo.; on the Wabash Railroad; 18 miles E. S. E. of Mexico, 90 miles W. of St. Louis (for location, see map of Missouri, ref. 4–I). It is in an agricultural region, and has 7 churches, 3 hotels, several flour-mills, grain elevators, and woolen-mills, tobacco-factory, canning-factory, a State bank with capital of $25,000, and 3 weekly newspapers. Pop. (1880) 867; (1890) 1,138; (1900) 1,160. EDITOR OF OPTIC NEWS."

Wellsville: village; Allegany co., N. Y.; on the Genesee river, the Erie Railroad, and the Wells., Couder. and Pine Creek branch of the Buff. and Susquehanna Railroad; 8 miles S. by W. of Belmont, 26 miles S. W. of Hornellsville (for location, see map of New York, ref. 6–D). It has 2 national banks with combined capital of $150,000, a high school, a free public library, a daily, a semi-weekly, and a weekly newspaper, and several foundries, machine-shops, and tanneries. It is the center for the Allegany oil-field, and has large dairying interests. Pop. (1880) 2,049; (1890) 3,435; (1900) 3,556. E. W. BARNES, EDITOR OF "REPORTER."

Wellsville: city (laid out in 1823); Columbiana co., O.; on the Ohio river, and the Penn Co.'s Railroad; 20 miles N. of Steubenville, 48 miles N. W. of Pittsburg, Pa. (for location, see map of Ohio, ref. 3–J). It is in an agricultural and coal-mining region, and has 9 churches and chapels, a parochial, a private, and 3 public schools, a national bank with capital of $50,000, a private bank, 4 foundries and machine-shops, 4 brick-works, 3 potteries, 2 sewer-pipe and terra-cotta works, railway-shops, rolling-mill, boiler-works, soap-factory, and a weekly, a quarterly, and 2 daily periodicals. The massacre of the family of Logan, the celebrated Mingo chief, took place 2 miles below Wellsville in 1774. Pop. (1880) 3,377; (1890) 5,247; (1900) 6,146. EDITOR OF "UNION."

Wellwood, Sir HENRY MONCREIFF: See MONCREIFF.

Welsby, WILLIAM NEWLAND: law writer and editor; b. at Acton, Cheshire, England, 1803; studied at a private

school in Oakham, and afterward entered Cambridge University, graduating in 1823; studied law and was admitted to the bar in the Middle Temple in 1826, and after several years of successful practice on the Chester circuit was appointed junior counsel to the Government; in July, 1841, became recorder of Chester, and held this position till he resigned, shortly before his death at Chester, July 1, 1864. He published, with several associates, *Reports of the Decisions of the Court of Exchequer*, from 1836 to 1856 (27 vols.); edited, either alone or with associates, Chitty's *Collection of Statutes of Practical Utility* (4 vols., 1851–54); Archbold's *Criminal Pleading*; Sir Christopher Rawlinson's *Municipal Corporation Acts* (2d ed. 1849), besides other works; and was the author of *Lives of Eminent English Judges of the Seventeenth and Eighteenth Centuries* (1846). See the *Law Times*, vol. xxxix., p. 418. F. STURGES ALLEN.

Welsh, HERBERT: philanthropist; b. in Philadelphia, Dec. 4, 1851; son of John Welsh, minister to Great Britain 1877–79; graduated at the University of Pennsylvania in 1871, and afterward spent two years in Europe, devoting a portion of that time to the study of art in Paris. On his return he gave his attention to philanthropic projects, and after a visit to the Sioux reservation in 1882 became a zealous champion of the rights of the Indians, striving to induce the Government to adopt a more humane and consistent policy in its dealings with them. With this end in view he founded the Indian Rights Association, which has succeeded in carrying through several reform measures, and has exposed and defeated schemes to defraud the Indians. The holding of land in severalty, which was for a long time advocated by him, was finally introduced by the passage of the Dawes Bill. Other reforms that he has sought to carry out are the education of Indian children and the extension of law to the reservation. Among his writings are *Four Weeks among some of the Sioux Tribes of Dakotah and Nebraska in 1882* and *Report of a Visit to the Navajo, Pueblo, and Hualapais Indians of New Mexico and Arizona in 1884*.

Welsh Calvinistic Methodist Church, in Wales and the U. S. See METHODISM and PRESBYTERIAN CHURCH.

Welsh or **Cymric Language** [*Welsh* is from O. Eng. *wælisc*, *welisc*, deriv. of *wealh*, foreigner, Celt (see WALES); *Cymric* is from Welsh *Cymraeg*, Welsh, deriv. of *Cymry*, Welshmen]: the language of the people of Wales (and of Monmouthshire, England), who, after the end of the Roman occupation, were united under the name of the *Cymry* (land associates). They are entirely distinct from the "Cimmerians" of the ancients. Welsh is a Celtic language, and is most closely related to the Bretonic of Basse-Bretagne, and with the now extinct Cornish of Cornwall. Though up to the eighteenth century it was, like all the Celtic dialects of the British isles, steadily yielding to the English, it received at the end of that century, through the efforts of certain enthusiastic patriots, a new impulse, so that since then the number of those who speak Welsh has rather increased than declined. In imitation of a mediæval usage there is now held yearly an EISTEDDFOD (*q. v.*), or competitive exhibition, at which the best productions in Welsh poetry and music are awarded prizes. The successful poets are again called bards, and receive special bard-names. Furthermore, the Welsh language receives support from the Nonconformist sects, whose preaching services and Sunday-schools are conducted in Welsh, and whose religious books are published in the same language. There are published also over a score of newspapers in Welsh, several among the Welsh in the U. S. On the other hand, the number of those who speak only Welsh and not English is in constant decline. Certain *Ogam* inscriptions (see IRISH LANGUAGE) upon tombstones were long regarded as the oldest monuments of the Welsh language. These have now proved, however, to be Irish; after the withdrawal of the Romans Irish chiefs held sway from time to time in Wales. Leaving out of account a few glosses in manuscripts from the eighth century on, the literary monuments of the Welsh first begin to appear in fuller compass in manuscripts of the twelfth century, though the texts themselves are often older. The most important literary work of ancient Wales, the collection of laws, dates back in its substance to King Howel, or Hywel Da, of the tenth century. See WELSH LITERATURE. See also Walter's *Das alte Wales* (1859); Rhys, *Lectures on Welsh Philology* (2d ed. 1879); and Zeuss, *Grammatica Celtica* (2d ed. by Ebel, 1871).

The modern Welsh period begins with the Reformation in the sixteenth century. The language then used in the Bible translations and other religious writings is the basis and standard for the literary language of to-day. The Welsh of the newspapers is less strict and admits many Anglicisms. The language of poetry mixes the old with the new. The present colloquial Welsh diverges strongly from the literary language, and differs widely according to locality. The two main groups are the North-Welsh and the South-Welsh dialects. The best modern grammars are those of Spurrell (1848) and of Rowlands (1853); dictionaries, those of Owen Pughe (3d ed. 1866) and Silvan Evans (1887 ff., incomplete). See CELTIC LANGUAGES,

R. THURNEYSEN. Translated by BENJ. I. WHEELER.

Welsh Literature: the literature written in the Welsh or Cymric language. The earliest names which occur in the history of Welsh literature are those of the four bards Aneurin, Taliessin, Llywarch Hên, and Myrddin, called in Welsh *y Cynfeirdd* or the First Bards: but the date and authenticity of the poems ascribed to them, and even the existence of the bards themselves, have been called in question. Sharon Turner, in his *History of the Anglo-Saxons*, which appeared in 1799, treated these poems as historical documents; and in reply to the criticisms of John Pinkerton and Malcolm Laing, who disputed the claims of the poems to be considered authentic, he published in 1803 his *Vindication of the Genuineness of the Ancient British Poems of Aneurin, Taliessin, Llywarch Hên, and Myrddin*, in which, however, he argued for the genuineness of only a few of the poems of Taliessin. In 1849 Thomas Stephens published his *Literature of the Kymry*, in which he subjects the poems to a critical analysis, and admits the *Gododin* of Aneurin, and twelve out of the seventy-seven poems attributed to Taliessin to be genuine and as old as the sixth century. D. W. Nash, in his *Taliesin, or the Bards and Druids of Britain*, published in 1858, limits his inquiry to the Taliessin poems, and attempts to prove that none of the poems is older than the twelfth century. Matthew Arnold, in his *Study of Celtic Literature*, shows how Nash has suppressed the facts which tell against his contention; and W. F. Skene, in his *Four Ancient Books of Wales*, calls Nash's work "a very clever piece of special pleading." Prof. Rhys (*Hibbert Lectures*, 1886) regards Myrddin and Taliessin as mythical personages; Myrddin is the Merlin of the romances, and the second element of Taliessin's name is identical with Ossín, or Ossian, the name of the mythic poet of the Gaels. The oldest versions of the works of the *Cynfeirdd* are given in Skene's *Four Ancient Books of Wales*; they are taken from the *Black Book of Carmarthen*, which was written in the twelfth century, and is, with the exception of two fragments of the ninth century, the oldest Welsh MS. extant, *The Book of Aneurin*, the *Book of Taliessin*, two MSS. of the thirteenth century, and the *Red Book of Hergest*, a MS. of the fourteenth century. In these texts several of the poems are irregular in metre, and have faulty rhymes; but no philologist seems to have tested the effect on rhyme and scansion of transforming the words into their known or hypothetical sixth century forms. On the whole, the poems which seem to lay most claim to this early date are the *Gododin* of Aneurin, the poems of Llywarch Hên, and a few of the poems attributed to Taliessin. The *Gododin* is a poem of 939 lines, commemorating the battle of Cattraeth, which was fought between the Strathclyde Britons and the Saxons of Deira and Bernicia about the year 567. It relates the prowess of the British warriors, and contains numerous instances of the feeling for color and the clear perception of nature which distinguish the poetry of the Celts. The fall of the British at Cattraeth is attributed to their over-indulgence in the wine and mead cups—"wine and mead from golden vessels was their drink," "mead was their liquor and it proved their bane."

The principal works of Llywarch Hên are his *Song in Praise of Urien*, his *Elegy on Cynddylan*, his *Ode to his Old Age and Lament for his Sons*. Matthew Arnold, in his *Study of Celtic Literature*, instances in the poems of Llywarch Hên the fierce, passionate melancholy, which he calls the "Titanism of the Celt":

"O my crutch! is it not the first day of May? The furrows, are they not shining; the young corn, is it not springing? Ah! the sight of thy handle makes me wroth . . .

"How evil was the lot allotted to Llywarch, the night when he was brought forth! sorrows without end and no deliverance from his burden."

Mrs. Hemans has paraphrased part of Llywarch's lament and four stanzas of the *Elegy on Cynddylan*:

> The Hall of Cynddylan is gloomy to-night,
> Since he is departed whose smile made it bright!
> I mourn; but the sigh of my soul shall be brief,
> The pathway is short to the grave of my chief.

But Mrs. Hemans's versions give no indications of the terseness of Llywarch's style; as when, discoursing on the helplessness of old age and on the shortness of man's life, he introduces, suddenly and without preface, the following triplet:

> This leaf, tossed to and fro by the wind,
> Woe to it its fate!
> Old, it was born but this year;

and proceeds with his reflections, leaving to his reader the application of the simile. Nearly all the poetry of Llywarch Hên consists of rhymed triplets, of which the first two lines are usually of the peculiar form called *paladr englyn*. The first line of a *paladr* contains from nine to twelve syllables, the second line usually five or six. The last word of the first line comes after the rhyme of the line and alliterates or rhymes with a word at the beginning of the second line; thus:

> Kyt delei gymry ae elyf*lu* oloeg*er*
> Allaw*er* o bell t*u*.

The twelve triplets contained in the ninth century fragments above alluded to are of exactly this form; and Prof. Rhys has detected a perfect *paladr* in an inscription of the fifth or sixth century. (Rhys's *Arthurian Legend*, p. 385.) This discovery shows that the metre is old enough to satisfy all the claims of age made on behalf of the poems; but it does not prove those claims, for the *paladr*, as an essential part of an *englyn*, is to this day one of the most widely practiced of Welsh metres.

Taliessin was anciently styled *Pen Beirdd*, that is, Chief of Bards; but the merit of the few indisputably early Taliessin poems does not bear out this description of him, and indeed falls far short of that of the works of Aneurin and Llywarch Hên. It is possible that these poems were written by a real Taliessin, who in later times was confused with a mythical Taliessin celebrated by tradition as Pen Beirdd, and to be equated with the Gaelic Ossian. Myrddin's name is purely mythical, and all his poetry was written for him by twelfth century bards.

There are not many poems which claim to have been written during the period between the sixth and twelfth centuries. A few attributed to Cuhelyn, Elaeth, and Meigant are found in the *Black Book of Carmarthen*, and one to Tyssilio in the *Red Book of Hergest*; but, as Skene remarks, "the number of such poems is so small that, if the poems attributed to the bards of the sixth century really belong to that period, there is an interval of several centuries, during which such a literature either never existed or has perished." In prose, however, the period is represented by the famous laws of Howel Dda, which were composed in the tenth century.

The twelfth century witnessed a great revival of Welsh literature. The *Mabinogion* and older Arthurian tales, which had been handed down by oral tradition, were now committed to writing. Geoffrey of Monmouth in 1145 wrote in Latin the legendary history of Britain, and in twenty years' time Arthur and his knights were household names throughout Europe (Nutt's *Holy Grail*, p. 229.) The continental Arthurian tales found their way to Wales, and formed the basis of the later Welsh romances. The *Red Book of Hergest* contains eleven Welsh tales and romances, which were published, with an English translation, by Lady Charlotte Guest, in 1849, under the title of *The Mabinogion, from the Llyfr Coch o Hergest*. Of the eleven, four only are entitled to the name *Mabinogion*; and these, with three other tales, form the older group, and are of purely Welsh origin; the remaining four, though all the proper names in them are Welsh, bear marks of foreign influence. Of the older tales, two only relate to Arthur, one of which, the tale of Kulhwch and Olwen bears the stamp of the most remote antiquity; the other five, including the four *Mabinogion* proper, contain no mention of Arthur's name. The later romances are purely Arthurian; one of these furnished Tennyson with the materials for his *Geraint and Enid*. No description can be attempted here of the magic beauty of these tales; it has deen described in glowing words by Matthew Arnold, and by John Richard Green in his *Short History of the English People*, and the reader may form some estimate of it from the excellent translation of Lady Charlotte Guest.

The other prose works of the twelfth and thirteenth centuries consist of Welsh histories, original and translated, the Welsh grammar of Edeyrn Dafod Aur, and several works on theology.

The poetry of this period is chiefly heroic. It begins with a long ode by Meilir to the memory of Griffudd ap Cynan, Prince of North Wales, who died in 1137. There also exists a fragment by Meilir referring to an event which took place in 1080; but the poem was not necessarily (as Stephens assumes) written at that date. Almost every line of Meilir's poetry exhibits the echoing rhymes and alliteration which developed by degrees into the *cynghanedd* of the fourteenth century. Meilir was followed by his son Gwalchmai, who wrote several odes in honor of Owain Gwynedd, son and successor of Gruffudd ap Cynan. One of these odes is given in the *Specimens* of the Rev. E. Evans, to whom Bishop Percy (editor of the *Reliques*) wrote of it that it was "one continued fiery torrent of poetic flame, which, like the eruptions of Ætna, bears down all opposition." This ode has been rendered into English verse by Gray, under the title of *The Triumphs of Owen*. But the most remarkable of Gwalchmai's works is a poem entitled *Gorhoffedd Gwalchmai* (Gwalchmai's Boast), which contains the bard's reflections in camp at dawn when he has been keeping watch all night. Gwalchmai was in his turn followed by his two sons—Meilir, who composed a quantity of devotional poetry, and Einion, whose most important work is *An Elegy on Nest the daughter of Hywel*, but who is best known as the hero of a famous fairy legend preserved in the Iolo MSS. The twelfth century is noted in the history of Welsh literature for its poet-princes, Owain Kyveiliog, the Prince of Powys, and Howel the son and successor of Owain Gwynedd, mentioned above. Two poems of Owain Kyveiliog have come down to us, the more important being *The Hirlas Horn*, a rendering of which will be found in Mrs. Hemans's works. The extant works of the other poet-prince, Howel ab Owain, consist of a fine patriotic ode and a series of exceedingly beautiful love-lyrics.

Kynddelw, at once the most difficult and the most voluminous of mediæval bards, flourished during the latter part of the twelfth century. His style is usually so involved and complicated that it is difficult to estimate his poetical merit. His younger contemporary, Llywarch ap Llywelyn, one of the bards of Llywelyn the Great, was a poet of very uncommon power.

The praises of the greatest of Welsh princes, Llywelyn ab Iorwerth, were also celebrated by other bards, among whom Dafydd Benvras, Einion ap Gwgawn, Elidir Sais, and Einion Wann deserve mention. The next generation of poets comprises the bards of Llywelyn's grandson, Llywelyn ap Gruffudd, the last Prince of Wales, who was killed in 1282. Llygad Gwr wrote a panegyric in five parts upon this prince; Bleddyn Vardd and Gruffudd ab yr Ynad Coch wrote elegies upon him, that of the latter being among the most impassioned and truly poetical verses in the language. (See Stephens, *Literature of the Kymry*.) We have been able to mention only a few bards of the twelfth and thirteenth centuries, but some conception of the extent of the poetical literature of the period may be gathered from the fact that the *Myvyrian Archæology* alone contains the works of twenty-eight bards who flourished during that time.

The fourteenth century has been called "the golden age of Welsh poetry." The tumult and perils of war no longer occupy the muse of the bards: with the exception of elegies, which the inherent melancholy of the Celt will at all times produce, almost the only subjects of song are nature and love. Perhaps the earliest of the new school of bards was Rhys Goch ap Rhiccert, who wrote a number of exquisite love-songs, of which a collection of twenty is preserved in the Iolo MSS. Stephens has discussed these poems at some length.

The intrusting of a love-message to a bird or other creature seems to have been introduced into Welsh poetry by Rhys Goch, though Davydd ap Gwilym is usually credited with its introduction. The former has several of these love-messengers:

> A nightly companion am I to the nightingale,
> Let her quickly go with my vocal song . . . .
> And thou, lark, bard of morning dawn,
> Show to this maid my broken heart.

Davydd ap Gwilym is considered by some critics to be the greatest of Welsh bards; he is also one of the few of whose history we have some little knowledge. He was born in 1300 and died in 1368. His father, Gwilym Gam, was dis-

inherited on account of his liaison with Ardudvul, Davydd's mother. Davydd was brought up by his maternal uncle, Ivor the Generous, at Maesalec, in Monmouthshire; his bardic instructor was another uncle, Llywelyn ap Gwilym, of Dol Goch in Cardiganshire. He lived the life of a troubadour, and was a welcome guest at every mansion in the country. He fell in love with Morvudd, the daughter of Madoc Lawgam, at Newborough, in Anglesey, and inscribed to her seven score and seven odes. Morvudd was married against her will to Cynvrig Cynin, an officer in Edward III.'s army. Davydd eloped with her; they were caught, and a heavy penalty was imposed upon the bard, which the men of Glamorgan paid for him. As a poet of nature Davydd ap Gwilym stands almost unrivaled. See an article by Prof. Lewis Jones in the *Transactions of the Cymmrodorion* (1893).

The three eisteddfods called those of the Renaissance were held in Davydd ap Gwilym's time, one at the house of each of Davydd's uncles, and the other at the house of the three brothers of Marchwiail, in Flintshire. It was probably at these eisteddfods that the *cynghanedd* was perfected and made a *sine qua non* of Welsh poetry. The *cynghanedd* is of three kinds; the first consists of a repetition of the same consonants in the same order at the two ends of the line, as in Davydd ap Gwilym's

*Br*eud*dw*yd yw e*b*r*w*y*dd*ed* oes;

here the four consonants *b*, *r*, *dd*, *d* are repeated, but the repetition of only one consonant if properly placed will form a correct *cynghanedd*. The meaning of the above line is "The swiftness of life is as a dream"; thus it is seen that a practiced bard need not write jargon even when he uses the most elaborate *cynghanedd*. The second kind consists of a rhyme in the middle of the line, and a correspondence of consonants between the second rhyming word and the end of the line, thus:

Gwull dol*au* a *ge*m*au* gw*y*dd.

The third and simplest is a correspondence of sound between the penultimate syllable of the line and some other syllable in the line, thus:

Ac yng nghyfn*od* dy fl*od*au.
Ysgwyd l*wyth* o bêr ff*wyth*ydd.

Nearly the whole of Davydd ap Gwilym's poetry is written in a metre of seven syllables, every line of which contains one of the three kinds of *cynghanedd*. Each of the three takes an endless number of forms, according to the position of the consonants and rhyming syllables; and as the accent is irregularly placed, poetry in *cynghanedd* is really less monotonous to read than in the regular feet of English poetry. The rudiments of the *cynghanedd* are found in the earliest Welsh poetry, and it practically continued to be the inseparable characteristic of all Welsh verse down to the last century, and is widely practised even now.

Several other bards of note took part in the proceedings of the three eisteddfods of the Renaissance. Madog Benvras, one of the three brothers of Marchwiail, wrote an elegy on Davydd ap Gwilym, which is printed in the works of the latter, and which proves its author to have been a poet of no mean order. Siôn Cent, called in English Dr. John Kent, wrote a large number of religious odes, and became a follower of Wyclif; many of his poems, including a scathing diatribe on the monks, are printed in the Iolo MSS. Rhys Goch Eryri and Iolo Goch are also mentioned in connection with these eisteddfods. Iolo Goch lived to see the insurrection under Owen Glendower, and wrote stirring odes of encouragement to the Welsh leader. We have still to mention Gruffudd Gryg, who engaged with Davydd ap Gwilym in a poetical contention of considerable length, and Gruffudd ap Meredudd ap Davydd, whose *Elegy on Gwenhwyvar of Anglesey* is one of the finest things of its kind in the language. Two famous poems, the *Ode on Myvanwy Vychan of Dinas Bran*, by Howel ab Einion, and the *Elegy on Lleucu Llwyd*, by Llywelyn Goch, must also be ascribed the former to the earlier half and the latter to the second half of the fourteenth century. The golden age of poetry seems to have produced very little prose literature. Davydd Ddu of Hiraddug wrote a treatise on poetry and metre; Gruffudd ab Adda ap Davydd composed a number of tales and fables; and a few works on geography and other branches of knowledge, contained in the *Red Book of Hergest*, were probably written during this period.

After Iolo Goch we meet with few names of distinction until we come to the middle of the fifteenth century. At the great eisteddfod held at Caermarthen in 1451, Llawdden perfected the rules of *cynghanedd*, and Davydd ab Edmwnd arranged the twenty-four metres of Welsh poetry. The new rules of *cynghanedd* exhibit a remarkable insight into the phonological laws of the language, but the too rigid observance of those laws, and, more particularly, the limitation of all poetical composition to the twenty-four arbitrary metres, had a crippling effect on the poetry of the succeeding age. Lewis Glyn Cothi, whose works were published in a volume of 510 pages at Oxford in 1837, flourished between 1450 and 1490. His works consist almost entirely of eulogy and elegy, and are interesting chiefly to the historian; but they are not without occasional passages of some beauty, as when he contrasts "the white shroud of Maredudd" with "the black gown of Morgan his father." About this time flourished Ieuan Brydydd Hir, whose poem on *Old Age* is still well known; and Maredudd ap Rhys, whose *Ode on Fishing*, in which he compares himself to the famous fisherman Madoc the son of Owain Gwynedd, has been adduced in support of the theory that the latter discovered America before Columbus! Ieuan Deulwyn and Lewis Morgannwg represent South Wales at this time; and shortly afterward Guttun Owain, bard and historian, and disciple of Davydd ab Edmwnd, appears in the north. His fellow disciple, Tudur Aled, who was also a nephew of the master, flourished from 1480 till 1525. Tudur Aled is one of the most famous of Welsh bards, and some of his lines are still current among the proverbs of Wales, such as—

Hysbys y dengys y dyn
O ba radd y bo 'i wreiddyn.

The objectiveness of Davydd ap Gwilym's poetry, still reflected in Davydd ab Edmwnd, now gives place to a subjectiveness which is very pronounced in Tudur Aled, and culminates in William Lleyn, a most eloquent bard who flourished about 1550, and in Siôn Tudur, who lived to welcome the publication of Dr. Morgan's Bible in 1588. No great prose work seems to have been written between 1450 and 1550; and the historical works of Guttun Owain and Lewis Morgannwg have not been published.

The first Welsh printed book appeared in 1546, and is of little interest from the literary point of view. It contains the alphabet, a calendar, the Creed, the Lord's Prayer, the Ten Commandments, etc. In 1567 Dr. Griffith Roberts published at Milan his Welsh grammar, written in Welsh, and exhibits a rare degree of literary merit. In the same year the first complete translation of the New Testament was published in Welsh by William Salesbury (who had published a small Welsh and English vocabulary in 1547). In point of language Salesbury's Testament and Roberts's grammar present a striking contrast. Dr. Roberts, by acknowledging the facts of sound-change in words borrowed from Latin, was enabled to discover several of the laws governing that change; Salesbury wished to ignore those facts, and attempted to restore every borrowed word into its original Latin form; thus for *dibynnu* he wrote *dependu*, for *eglwys* he wrote *eccles*, and so rendered his Testament unintelligible to the people for whom it was designed. The whole Bible, translated into natural and clear Welsh by Dr. William Morgan, Bishop of St. Asaph, appeared in 1588. A new version, revised by Bishop Parry, with the assistance of Dr. John Davies, of Mallwyd, appeared in 1620, and is, with a few orthographical modifications, the version of the Welsh Bible still in use. About the middle of the seventeenth century Morgan Llwyd published eight works in defense of the Puritans, of which *The Book of the Three Birds* is the most important. In 1671 Charles Edwards published his *History of the Faith*, an original work of great merit, which has gone through several editions since that date. Almost all other books published in Welsh during the seventeenth century were translations of second-rate English theological works. In the early part of the century Edmund Prys composed his metrical version of the Psalms, which is sung in the chapels and churches of Wales to the present day. The only other poet of this period that need be mentioned is Hugh Morris, of Pontymeibion, who popularized the regularly accented song metres, though he continued the use of the *cynghanedd* even in these. Hugh Morris was the first, and perhaps the greatest, of the Welsh ballad-writers. He died in 1709 in his eighty-eighth year.

Ellis Wynne published his *Visions of the Sleeping Bard* in 1703. The work is not original in its conception, being based upon the *Visions* of the Spanish writer Quevedo, but it is generally admitted to be, with the exception of the Mabinogion, the finest Welsh prose ever written. In 1718

Theophilus Evans published his Welsh history under the title of *Drych y Prif Oesoedd.* Historically the work is of no value; the argument is often puerile and the criticism contemptible; but it possesses a certain distinction of style, and relates the old legends with a certain charm, which won for it great popularity among successive generations of Welsh readers. Lewis Morris, of Anglesey, one of the most brilliant and versatile of Welshmen, was born in 1702. He was an able mathematician and mineralogist; he surveyed the coast of Wales for the admiralty, and superintended the working of the king's mines. His skill in medicine and surgery brought the poor from all directions to seek his help, which was never refused. A contemporary triad says of him that "he could build a ship and sail it, make a harp and play it, compose a *cywydd* and sing it." In his leisure hours he applied himself to the study of Welsh literature and antiquities, and wrote a number of short poems in a light vein, which possess a sparkle almost unequaled in the whole range of Welsh poetry. But his indirect influence on the development of Welsh literature is not to be measured by his written works. He became the bardic instructor of the Rev. E. Evans (Ieuan Brydydd Hir, the younger), who, at the suggestion of Bishop Percy, published in 1764 the *Specimens of Welsh Poetry* alluded to above, and of Goronwy Owen, the greatest bard who had appeared since Tudur Aled. Goronwy was born in 1722, of poor parents, in a remote corner of Anglesey; he was educated, by the aid of Lewis Morris, at the Bangor Grammar School and Jesus College, Oxford; he failed to obtain a curacy in Wales, and lamented his exiled lot in a series of poems which surpass the greatest elegiacs of Tudur Aled. His works furnished the models for all the best poetry in *cynghanedd* written in the nineteenth century. Lewis Morris also, together with his brother Richard Morris, was chiefly instrumental in founding the Welsh Society in London, which has done so much since for Welsh literature. The chief members of that society during the latter part of the eighteenth century were Owen Jones (Owain Myvyr) and William Owen (afterward Dr. Owen Pughe), who jointly edited the works of Davydd ap Gwilym, published in 1789 in a thick octavo volume, and compiled, with the collaboration of Iolo Morganwg, *The Myvyrian Archaiology*, published in three large volumes, 1803–08, at the expense of Owain Myvyr, who spent £2,000 on the publication. This work contains most of the extant works of the earliest bards up to the fourteenth century, the mediæval historical romances, the Welsh laws, and other treasures of Welsh literature. Dr. Pughe also published in 1803 his Welsh dictionary, in which he refers every word to an imaginary Welsh root, and unhesitatingly distorts it, if necessary, to suit his theory. Pughe's efforts to promote the study of the old literature are laudable, but he produced a baneful effect upon the written Welsh of the nineteenth century. Iolo Morganwg was the last of a school of Glamorganshire bards, who had rebelled against the decisions of the Caermarthen eisteddfod of 1451, and, to uphold their own authority, had invented a system of bardism, with bardic rites and a bardic congress or *gorsedd*, proclaiming these to have been handed down from the time of the Druids. Iolo, the inheritor of their traditions, resuscitated the eisteddfod, and grafted upon it their *gorsedd*, which called itself "the Gorsedd of the Bards of the Isle of Britain." It is to the eisteddfod that we owe some of the best works of the nineteenth century bards. Meanwhile a religious revival had taken place in Wales in the early part of the eighteenth century, and had produced the hymns of Williams of Pantycelyn and of Anne Griffiths. Griffith Jones, of Llanddowror, had founded his 3,000 schools, in which the people were taught to read the Welsh Bible; these had been followed by the foundation in 1780, by Thomas Charles, of the Sunday-schools, which in a short time found their way into every parish and village in the country, and literally converted the Welsh people into a nation of readers. The prose writings of the nineteenth century are chiefly theological, deriving their inspiration from the religious movement, but also partly literary, deriving their inspiration from the eisteddfod. Of the more important literary works we may mention the histories of Carnhuanawc and Gweirydd ap Rhys; the critical essays of Gwallter Mechain and Dr. Lewis Edwards; the works of the brothers Roberts of Llanbrynmair; the life-sketches of Dr. William Rees; the novels of Mr. Daniel Owen; and the Welsh encyclopædia of Messrs. Gee, of Denbigh, published in ten bulky volumes, and now passing through a second edition. The poets of this century are exceedingly numerous; the most eminent are Robert ap Gwilym Ddu, the epigrammatist; Dewi Wyn, the author of the famous ode on *Charity*; Ieuan Glan Geirionnydd, the most polished of Welsh hymn-writers; Eben Vardd, the author of *The Fall of Jerusalem*; Emrys, the poet of nature; Islwyn, the poet of melancholy; and Ceiriog, the Welsh Béranger. The production of fresh literature is increasing rather than declining, and the number of its readers may be gauged by the extent of Welsh periodical literature. In 1828 there were, according to John Blackwell (Alun), 14 monthly periodicals published in Welsh, to the pages of which the peasantry were almost the only contributors. At the time of writing (1895) there are issued, of periodicals printed entirely in Welsh, 2 quarterlies, 2 bi-monthlies, about 20 monthlies, and about 24 weekly papers; and Welsh reading is given in 14 English papers circulating in Wales. See Stephens's *Literature of the Kymry* (2d ed. 1876).

J. Morris Jones.

Welsh Onion [*Welsh* = Germ. *Walsch.* See Wales]: another name for the Cibol (*q. v.*).

Welwitsch, wel'wich, Frederick, M. D., F. L. S.; botanist; b. at Klagenfurt, Austria, Feb. 25, 1806; spent eighteen years in the Portuguese possessions of Western Africa, where he collected over 40,000 specimens of plants, which he brought to England, and published several works on African botany and on natural history. D. in London, Oct. 20, 1872. In 1863 he discovered at Mossamedes, West Africa, a remarkable plant which he named *Tumboa*, but which was subsequently named by Dr. J. D. Hooker *Welwitschia mirabilis.* It is placed among the *Gnetaceæ*, an order nearly allied to the conifers; is never above a foot high, though its trunk is sometimes 6 feet in diameter; is found only in an elevated rainless, stony plateau; attains an estimated age of above a century; produces flower-stalks 12 inches high, cones 2 inches long, and two flat leaves 6 feet long, which lie prostrate upon the ground. Revised by C. E. Bessey.

Wemyss, Francis Wemyss Charteris Douglass, Earl of: See Elcho.

Wen: a cystic tumor occurring upon the surface of the body, especially on the scalp. It originates by the occlusion of a follicle of the skin or scalp, and the subsequent slow accumulation of sebaceous matter secreted by the lining of the cyst. The tumor, therefore, is round and symmetrical, and, causing a distension of the overlying skin or scalp, is smooth and shiny. It may be soft, semi-solid, or indurated, according as its contained sebaceous matter is fluid, rich in pultaceous fatty granules, or has had its fluid elements absorbed, leaving only inspissated and calcific substance. The wen is a harmless, non-malignant tumor. Whether single or present in large numbers, its removal is easy and harmless.

Wen'ceslas, or **Wenzel**: Emperor of Germany (1378–1400); b. at Nuremberg, Feb. 20, 1361; a son of the Emperor Charles IV., of the house of Luxemburg. A violent and self-indulgent ruler, he was unable to cope with the difficulties that the disordered state of the empire at that time presented. In Bohemia, which was his hereditary dominion, and of which he had been crowned king when only three years old, he ruled with the highest degree of arbitrariness and cruelty. He was unable to compose the difficulties between the princes and the free cities, and in his reign the foundation of Swiss independence was laid by the victory at Sempach over the house of Hapsburg. In 1393 he caused John Nepomuk to be tortured and thrown into the Moldau, and soon afterward the Bohemian nobles, who hated him for the partiality he showed toward the Germans, formed a conspiracy against him, headed by his own brother, Sigismund, King of Hungary, seized him, and held him a prisoner at Prague for several months. He was finally restored to liberty, but his power was thenceforth much circumscribed in Bohemia. In Germany, where his influence never had been great, he finally lost all authority, and when he sold the duchy of Lombardy to one of the Visconti and allied himself with France for the purpose of ending the papal schism by deposing both Boniface IX. and Benedict XIII., the electors of Mentz, Cologne, Treves, and the Palatinate assembled at Oberlahnstein and formally deposed him (Aug. 20, 1400). Rupert of the Palatinate, who was elected emperor in his stead, was never generally acknowledged, but when, after the death of Rupert in 1410, Sigismund of Hungary was elected emperor, Wenceslas renounced his claims on the German crown, though he continued to bear the title till his death Aug. 16, 1419. See Lindner,

Geschichte des Deutschen Reichs unter König Wenzel (1875–76), and *Reichstagsakten unter König Wenzel* (edited by Weizsäcker, 1868–77). F. M. C.

Wendell, Barrett: author; b. in Boston, Mass., Aug. 23, 1855; graduated at Harvard College 1877; became instructor in English at Harvard 1880, and assistant professor of that subject 1888; has published the works of fiction *The Duchess Emilia* (Boston, 1885) and *Rankell's Remains*; also *English Composition* (New York, 1891); and *Cotton Mather* in Makers of America Series (1891).

Wend Language: See Slavic Languages.

Wends: originally a general designation of the Slavs by their Teutonic neighbors, the word being derived according to Šafařik from a Slavonic root (Pol. *woda*, Russ. *voda*, Lithuanian *wandů*, water), and thus designating the people dwelling about water. The Wends are supposed to have been the earliest dwellers on the Baltic coast, and to have been driven away by the Goths (the *Guttones* of Pytheas) in the fourth century B. C. (Cf. Bradley, *The Story of the Goths*.) At present by Wends are understood the Slavs of Upper and Lower Lusatia (Germ. *Lausitz*, derived from Slav. *lug* or *luza*, a low, marshy country), who are entirely surrounded by Germans and have no connection whatever with other Slavs. They call themselves Serbs (*Serbjo*), and were called *Sorbs* or *Sorabi* by the old German chroniclers. According to the earliest historical reports the Wendish country extended about from the Saale and Spree to the Bober, i. e. from the present site of Berlin to the Lusatian Mountains, or over Brandenburg, Saxony, and Lower Silesia. Their language belongs to the western branch of the Slavic family, is closest cognate to Czech, and divides itself into two strongly differing dialects: Upper Sorabish and Lower Sorabish. Mucke's statistics, *Statistika łužiskich Serbow* (Bautzen, 1884–86), give the total number of the Wendish-speaking people at 173,469 (98,059 Upper Sorbs, 75,410 Lower Sorbs). The Wends are rapidly being Germanized. The people, mostly peasants, have a rather insignificant literary development, mostly of a religious character. The literary society *Maćica serbska* (founded in 1847 at Bautzen) issues a periodical, *Casopis maćicy serbskeje*, the chief depository of literary production in Wendish; also a weekly paper in Bautzen, *Serbske Noviny* (Wendish News). There are several good grammars. The best for Upper Wendish is Pfuhl's *Laut und Formenlehre der oberlausitzisch-wendischen Sprache* (Bautzen, 1867); also that by Liebsch (1884); the only one for Lower Wendish is Hauptmann's *Niederlausitzisch-wendische Grammatica* (Lübben, 1761); Schmaler's *Volkslieder der Wenden*, with a map of the Wendish language domain, and a translation of Wendish folk-songs is excellent (2 vols., Grimma, 1841–43); also see R. Andree, *Wendische Wanderstudien* (Stuttgart, 1873); and *Sprachgebiet der lausitzer Wenden* (Prague, 1873). The *Winds*, a name given by the Germans to the Slovenes of Carinthia, Carniola, and Styria, are a different Slavic branch, to be carefully distinguished from the Wends.

Hermann Schoenfeld.

Wendt, *vent*, Hans Hinrich, Ph. D., D. D.: Protestant theologian; b. in Hamburg, Germany, June 18, 1853; became privat docent of theology at Göttingen 1877; professor extraordinary 1881; ordinary professor at Kiel 1883, at Heidelberg 1885, at Jena 1893. He wrote *Die Begriffe Fleisch und Geist in biblischen Sprachgebrauch* (Gotha, 1878); *Die Christliche Lehre von der menschlichen Vollkommenheit* (Göttingen, 1882); *Die Lehre Jesu* (2 vols., 1886–90; Eng. trans. of 2d vol., *The Teaching of Jesus*, 2 vols., Edinburgh, 1892); *Die Aufgabe der systematischen Theologie*, inaugural (Jena, 1893). S. M. J.

Wener, Lake: the largest lake of the Scandinavian peninsula; in the southern part of Sweden; 30 miles from the Cattegat, at an elevation of 144 feet; area, 2,150 sq. miles. It receives the Clara-elf, and sends its waters to the Cattegat through the Götha-elf. It is connected with Lake Wetter by canals, and thus an inland communication is established between the Baltic and the Cattegat.

Weno'na: city; Marshall co., Ill.; on the Chi. and Alton and the Ill. Cent. railways; 20 miles E. of Lacon, the county-seat, 20 miles S. of La Salle (for location, see map of Illinois, ref. 4–E). It is an important grain center, and has bituminous coal mines, zinc-works, a national bank with capital of $50,000, a private bank, and a weekly newspaper. Pop. (1880) 911; (1890) 1,053; (1900) 1,486.

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Wens'leydale, James Parke, Baron: jurist; b. at Highfield, near Liverpool, England, Mar. 22, 1782; in 1799 entered Trinity College, Cambridge, as a pensioner, graduated in 1803, and became a fellow of Trinity in 1804. In 1813, after practicing for several years as a special pleader, he was called to the bar, at the Inner Temple, and, choosing the northern circuit, soon gained a large practice, hereby acquiring that familiarity with maritime law for which he was afterward noted as a judge. In 1820 he was chosen to assist the crown officers in the trial of Queen Caroline before the House of Lords, and in 1828, without any parliamentary or political interest, was appointed a puisne judge of the king's bench. On the death of Baron Taunton he was transferred to the exchequer, and made a member of the privy council, 1834. He retained his seat in the exchequer until, resigning in Dec., 1855, he was created a life peer, and called to the House of Lords by Lord Palmerston. This gave rise to the discussion as to his right to sit and vote in Parliament, which resulted in the rejection of the limited peerage scheme, and the grant to him of a new patent whereby he was made a hereditary peer with the title of Baron Wensleydale of Walton; but as he died childless, the title became extinct. He was one of the last judges to deliver written judgments systematically, many of his being valuable as legal treatises. D. at Ampthill Park, Bedfordshire, Feb. 25, 1868. F. Sturges Allen.

Wentletrap [from Dutch *wenteltrap*: Germ. *wendeltreppe*, winding staircase, wentletrap; *wenden*, turn + *treppe*, stair, stairs]: any shell of the family *Scalaridæ* of gasteropod mollusca. The shells are white, with the whorls ornamented by transverse ribs. Some of the species are said to secrete a purple fluid. About 150 species are known, mostly from tropical seas, though several occur on the New England shores. A single specimen of the Chinese species (*Scalaria pretiosa*) has been sold for $250, but now will bring not more than one or two dollars. J. S. K.

Wentworth, Alonzo Bond: See the Appendix.

Wentworth, Benning: Governor of New Hampshire; b. in Portsmouth, N. H., July 24, 1696; graduated at Harvard 1715; became a merchant; was frequently elected to the Assembly; was appointed a member of the council 1734; was royal Governor from 1741 to 1767; made grants of land in Southern Vermont, occasioning the conflict with New York concerning jurisdiction over the New Hampshire grants, and gave to Dartmouth College 500 acres of land, on which its buildings were erected. D. in Portsmouth, Oct. 14, 1770. Bennington, Vt., was named in his honor.

Wentworth, Charles Watson: See Rockingham, Marquis of.

Wentworth, Sir John, Bart., LL. D.: Governor of New Hampshire; nephew of Gov. Benning Wentworth; b. at Portsmouth, N. H., Aug. 9, 1737; graduated at Harvard 1755; went to England as agent of the province 1765; obtained through the Marquis of Rockingham the appointments of surveyor of the king's woods in America and that of Governor of New Hampshire, which he held in 1767–75; gave its charter to Dartmouth College; encouraged agriculture and promoted the settlement of the colony; went to England at the outbreak of the war of the Revolution (1775), and remained there until peace was declared. His property was confiscated; was Lieutenant-Governor of Nova Scotia 1792–1808, and was created a baronet 1795. D. at Halifax, N. S., Apr. 8, 1820.

Wentworth, Thomas: See Strafford, Earl of.

Wenzel: See Wenceslas.

Werdau, *vär'dow*: one of the chief manufacturing towns in the kingdom of Saxony; a central station of the Saxon state railways; on the Pleisse, about 40 miles S. of Leipzig (see map of German Empire, ref. 4–G). It manufactures cloth, yarn, and wool, has important dyeing establishments and machine-shops, furnishing especially spinning-machines, and electric-light machines. Werdau was first mentioned as a town in 1304, and in 1398 it was purchased by the Margrave of Meissen. Pop. (1890) 16,253. H. S.

Werder, *vär'der*, August, Count von: general; b. at Schlossberg, East Prussia, Sept. 12, 1808; entered the Prussian army in 1825; took part in the Russian campaigns in the Caucasus in 1842–43; became a member of the staff in 1846; was raised to the rank of lieutenant-general in 1866, and led the Third Division at Gitschin and Königgrätz in the campaign against Austria. In the war against France in 1870 he was a member of the staff of the crown

prince, but soon received the command of the Baden-Würtemberg Army-corps, which he led at Wörth Aug. 6, 1870. He conducted the siege of Strassburg; was made a general of infantry after the capitulation of the fortress; and repulsed victoriously (Jan. 15–17, 1871) the attack of Bourbaki at Belfort, which success made him very popular in Southern Germany. His statue was raised at Freiburg. In 1875 he was invested with the insignia of the order of the Black Eagle. In 1879 he was retired from the army and created Count von Werder. D. at Schloss Grüssow, Pomerania, Sept. 12, 1887. See von Conrady, *Leben des Grafen August von Werder* (1889). Revised by F. M. Colby.

Weregild, or **Wergild**: in old Teutonic law, a fine exacted of a murderer or perpetrator of other heinous crime against the person. In case of a murder the guilty party paid to the relatives of the deceased a certain sum varying with the rank of the victim, and thereby purchased immunity from their vengeance. Among the Anglo-Saxons the value of a man's life was fixed according to his rank, and the fines for murders ranged from 200*s.* for killing a churl (*ceorl*) to 7,200*s.* for killing the king.

Wergeland, *vär'ge-lănd*, Henrik Arnold Thaulow: poet; b. at Christiansand, Norway, June 17, 1808; studied theology at the University of Christiania; received in 1836 an appointment at the library; became keeper of the archives of the state in 1840. D. Aug. 12, 1845. In 1830 he published *Skabelsen, Mennesket og Messias* (The Creation, Man, and the Messiah), a very long lyric poem, in which he gave expression to the religious and philosophical thoughts with which he was filled at that time. Besides many tragedies, vaudevilles, farces, etc., he wrote *Jöden* (The Jew); *Jan van Huysums Blomsterstykke* (Jan van Huysum's Flower-piece); and *Den Engelske Lods* (The English Pilot) (1845), the last being his most interesting poem. His influence on Norwegian literature and civilization can by no means be measured by the æsthetic worth of his works. (See Norwegian Literature.) A good selection of his works appeared in 1859 in 1 vol. His collected works (9 vols.) appeared at Christiania, 1852–57. See Lassen, *Henrik Wergeland og hans Samtid* (2d ed. Christiania, 1877).
Revised by D. K. Dodge.

Werner, *vär'ner*, Abraham Gottlob: geologist; b. Sept. 25, 1750, at Wehrau, Upper Lusatia, where his father was director of smelting-works; studied at the mining-school of Freiberg and at the University of Leipzig, and was appointed Professor of Mineralogy in 1815 at Freiberg, Saxony, where he died June 30, 1817. His writings are not numerous, comprising only a few minor books, or pamphlets—*Ueber die äussern Kennzeichen der Fossilien* (Leipzig, 1774; translated into English by Weaver, Edinburgh, 1849); *Kurze Klassifikation und Beschreibung der Gebirgsarten* (Dresden, 1787); and *Neue Theorie über Entstehung der Gänge* (Freiberg, 1791; translated into English by Charles Anderson, Edinburgh, 1809). But by his lectures, to which students from all European countries gathered, he gained many disciples, and his theory, the so-called Neptunian, forms a most important chapter in the history of geology. In 1845 the Wernerian Society was founded in Edinburgh by one of his disciples, Robert Jameson.

Werner, Friedrich Ludwig Zacharias: dramatist; b. at Königsberg, Germany, Nov. 18, 1768; studied law at the university there, and entered the Prussian civil service in 1793, holding office in Warsaw till 1805, then in Berlin. While in Warsaw he wrote in 1800 his first drama, *Söhne des Thals*, inspired by his enthusiasm for the Freemasons, and in 1804, the *Kreuz an der Ostsee*, to which Hoffmann composed the music. In Berlin he wrote *Martin Luther, oder die Weihe der Kraft*, and *Der 24ste Februar*. This last drama is known in the history of literature as one of the worst examples of the so-called *Schicksalstragödie* in which Fate is made the absolute ruler of human destiny—not the Mohammedan fate, which may fill the heart with fanatical enthusiasm, but a peculiar, mystic, and fantastic power, merely fit to strike the imagination with terror. The whole play is, like his other dramas, the outburst of an ill-regulated imagination, though its author was not without dramatic and poetic talent. It made a great sensation, and called forth scores of imitations. In 1807 Werner resigned his office in the Prussian service; traveled in Germany, Switzerland, and France; visited Goethe at Weimar and Madame de Staël at Coppet; went in 1809 to Rome; joined the Roman Catholic Church Apr. 19, 1811; was ordained a priest in 1814; preached in Vienna during the Congress, and created a sensation by the peculiar blending, in his sermons, of coarseness and real power. He spent 1816–17 in Podolia in the house of Count Choloniewski, but in the latter year he returned to Vienna, where he continued to preach with great effect till his death Jan. 17, 1823. His *Sämmtliche Werke*, with a biography by Schütz, were published in 13 vols. (Grimma, 1839–41), and contain, besides the above dramas, the tragedies *Attila*, *Wanda*, *Kunegunde*, and *Die Mutter der Makkabäer* (1820), lyrical poems, hymns, sermons, etc. See Hitzig, *Lebensabriss Z. Werners* (Berlin, 1823); H. Düntzer, *Zwei Bekehrte* (Leipzig, 1873); I. Minor, *Die Schicksalstragödie* (1883). Revised by Julius Goebel.

Wernerius: See Irnerius.

Wernigerode, *vär-nĕĕ-gā-rō'de*: district-town of Prussian Saxony, and chief place of the county belonging to the Stolberg family; at the north base of the Hartz Mountains, about 12 miles S. W. of Halberstadt. It has manufactures of wooden wares, cigars, woolen and linen fabrics, bricks and tiles. The castle of the Counts of Stolberg, with a fine view over the Hartz, has a select library of 95,000 vols. Pop. (1890) 9,966. H. S.

Wershetz: See Versecz.

Wesel, *vā'zel*: fortified town of Rhenish Prussia; at the confluence of the Rhine and the navigable Lippe, 46 miles S. W. of Münster (see map of German Empire, ref. 4–C). It is a station of the Rhenish railway system; has considerable traffic by steamboats with Amsterdam; exports wood and fish, and manufactures metal goods, pianofortes, sugar, etc. A railway bridge and a bridge of boats cross the Rhine here, both of which are protected by Fort Blücher as the *tête-de-pont* on the left bank. Wesel was once a member of the Hanseatic League, but lost its importance after the revolution of the Netherlands against Spain. A monument erected in 1835 commemorates the death of eleven officers of Maj. Schill who were shot by order of Napoleon in 1809 after their unsuccessful attack on Stralsund. Pop. (1890) 20,724, more than one-half Roman Catholics. H. S.

Weser, *vā'zer*: a river of Europe formed by the junction of the Fulda (which rises in the Rhöngebirge, on the frontiers of Prussia and Bavaria) and the Werra (which rises in the Thüringerwald), at Münden, Hanover, whence it flows northward, and enters the North Sea after a course of 250 miles. It is navigable for small craft to Münden, for vessels of considerable size to Bremen, but ships of the largest size ascend no farther than Bremerhaven, which is at its mouth, and was built for the accommodation of such vessels. This river is not of much consequence for traffic, though it communicates with the Elbe by a canal.

Wesley, Charles, M. A.: clergyman and poet; youngest son of the Rev. Samuel Wesley, rector of Epworth, Lincolnshire; b. at Epworth, Dec. 18, 1708, o. s. (Dec. 29, n. s.). In 1716 he was sent to Westminster School, under his elder brother, Samuel Wesley (*q. v.*). In 1721 Charles was admitted king's scholar at St. Peter's College, Westminster; in 1726 entered Christ Church College, Oxford. While there he became so serious, devout, and zealous that the wits at Oxford called him and his godly companions "Methodists," a title which had been given derisively to rigidly religious persons a century before. When, with his brother John, he was about to embark for America with Oglethorpe in 1735 he was ordained deacon, and soon after presbyter. After preaching in Frederica, Ga., he returned to England, reaching there on Dec. 3, 1736. On Whitsunday, May 21, 1737, he experienced the "witness of adoption," by which he was raised to a higher plane in the divine life—an event commemorated in his immortal hymn, "O, for a thousand tongues to sing!" Being excluded from the churches of the Establishment because of his "Methodism," he began at once to co-operate with his brother in his great work of evangelization. He traveled extensively in England and Wales, and was very successful as a preacher. But he is chiefly renowned as "the poet of Methodism." He wrote more than 6,000 hymns on every religious theme, versifying large portions of the Scriptures, including most of the Psalms. His hymns constitute the staple of the Methodist hymnals. D. in London, Mar. 29, 1788. Charles Wesley married in 1749 Sarah Gwynne, of Wales, by whom he had eight children. His eldest son, Charles, b. Sept., 1757, inherited the musical genius of his parents, and in his third year learned from his mother to play on the harpsichord. A year later his father introduced him to Dr. Boyce, a leading musician in London, where his astonishing precocity in

music led to the proposal that he should be a chorister in the chapel royal, an offer his father declined. For half a century, till his death in 1834, he had no rival at the organ, unless it was his brother SAMUEL, b. Feb. 24, 1766, who at the age of three played "God save great George, our king!" Fischer's minuet, which he had caught from street organs. The best organists in London took pleasure in teaching the two brothers gratuitously, as they could learn anything and play the hardest music at sight. Samuel became the foremost composer and performer of his age. He composed a high mass for the chapel of Pope Pius VI., who thanked him in a Latin letter written to the apostolic vicar in London. D. in London, Oct. 11, 1837. One of his sons, SAMUEL SEBASTIAN WESLEY, Mus. Doc. (1810–76), became equally distinguished as a musician. He was organist of several cathedrals, director of the "Three Choirs Festivals," and composed much important music. See *Lives* of Charles Wesley by Jackson (1841–49) and Telford (1886), and Stevenson's *Memorials of the Wesley Family* (1876). The poetical works of Charles and John Wesley were edited in a series of 13 vols., by Dr. George Osborn (London, 1868–72).

Revised by J. F. HURST.

Wesley, JOHN, A. M.: founder of Methodism; son of the Rev. SAMUEL WESLEY (*q. v.*) and Susannah (*Annesley*) Wesley; b. at Epworth, Lincolnshire, England, June 17, 1703, o. s. (June 28, N. S.). When nearly six years of age he narrowly escaped burning to death in a fire which consumed the Epworth parsonage. He received his early training principally from his mother. At the age of eleven he was sent to the Charterhouse School, London, where he made great attainments; in 1720 was sent to Christ Church, Oxford. Here he acquired extraordinary proficiency in all kinds of learning, especially in the classics, logic, and theology. He was ordained deacon Sept. 19, 1725, and presbyter Sept. 22, 1728; obtained a fellowship in Lincoln College, Oxford, Mar. 17, 1726; during that year assisted his father at Epworth; was made Greek lecturer and moderator of the classics Nov. 7, 1726; took his M. A. degree in Feb., 1727, and in that year he became his father's curate at Epworth and Wroote, but as it was necessary for him to reside at Oxford, he resigned the curacy and returned to Oxford Nov., 1729. He then became the head of the society at Oxford composed of Charles Wesley, and others, who were derisively called "Methodists" because they were so methodical in their lives and strict in the performance of religious duties. In 1735 the two brothers accompanied Oglethorpe to Georgia—John to be a missionary to the Indians, and Charles to be secretary to the Governor and a clergyman in the colony. The way was not opened for the mission to the Indians; and as the colonists would not endure the rigid, ascetic discipline which the Wesleys wished to enforce (being then of the extreme High-Church party), they returned to England, Charles in 1736, and John in 1738; but the first Sunday-school established in America is said to be the one organized by John Wesley in Savannah. He was all the time a sincere and devout Christian, full of good works, but he had not a clear sense of pardon by the witness of the Spirit, as he subsequently had. He says: "In the evening (of May 24, 1738) I went very unwillingly to a society in Aldersgate Street (London), where one was reading Luther's preface to the Epistle to the Romans. About a quarter before nine, while he was describing the change which he works in the heart through faith in Christ, I felt my heart strangely warmed. I felt that I did trust in Christ, Christ alone, for salvation; and an assurance was given me that he had taken away my sins, even mine, and saved me from the law of sin and death." While he was seeking this experience—viz., May 1, 1738—he formed the first Methodist "society," in Fetter Lane, London. The following summer he visited Count Zinzendorf and the Moravians in Germany to study their discipline and to intensify his spiritual life. On his return from Germany, being excluded from the churches of the Establishment because of his "Methodism," he imitated Whitefield, preaching in the fields and in private houses, wherever occasion served. The foundation-stone of his first chapel was laid in Bristol May 12, 1739. An old foundry in Moorfields, London, was purchased, and opened for preaching Nov. 11, 1739. Wesley says: "In the latter end of the year 1739 eight or ten persons came to me in London and desired that I would spend some time with them in prayer, and advise them how to flee from the wrath to come: this was the rise of the *united society*." From that period to the close of his life he was incessantly engaged in preaching, forming societies, governing them, providing them spiritual help. As their members increased rapidly in various parts of the kingdom, and as few clergymen would co-operate with him, while some repelled his followers from their churches, he was led to employ laymen to preach, though not to administer the sacraments. In 1742 Wesley instituted *class-meetings*—first at Bristol, where they were originated for the purpose of paying a debt on the chapel, but as they were found admirably adapted to maintain godly discipline and Christian fellowship, they became an important and permanent feature of Methodism. He held his first *conference* at the Foundry in London June 25, 1744, when there were present four clergymen, besides himself and his brother Charles, and four lay-preachers—ten in all. In Aug., 1744, he preached his last sermon before the University of Oxford. At the next conference (Aug. 1, 1745) only one clergyman besides himself and brother was present, the other seven being lay-preachers. The third conference was held at Bristol May 12, 1746. It was attended by John and Charles Wesley, John Hodges, and six lay-preachers. The work was then systematically arranged and divided into "circuits," and the call and qualifications of preachers were defined substantially as in the present Methodist Discipline. Twelve "assistants" were then recognized. Thus originated the Wesleyan system of itinerancy. In June, 1748, he opened Kingswood School, near Bristol, an institution designed for the education of preachers' sons and others. This was the nucleus of the system of literary and theological institutions which now obtains among the Methodists. At the twenty-seventh conference, held Aug. 7, 1770, "minutes" were adopted which led to a more formal and permanent separation from the Calvinistic Methodists, who were in connection with Whitefield and Lady Huntingdon. A sharp and prolonged controversy took place, in which the saintly Fletcher of Madeley came to the help of Wesley and defended his evangelical Arminianism against the fierce attacks of Toplady, Richard and Rowland Hill, and others. The Wesleyan Methodists have never since "leaned toward Calvinism." When he was fourscore years of age, he had "the Deed of Declaration" executed, Feb. 24, 1784, by which the government of the connection was assigned legally to the conference, consisting of 100 preachers and their successors forever. This fixed the *status* of British Wesleyan Methodism with regard to both doctrine and discipline. In 1766 two Irish local preachers, Philip Embury and Robert Strawbridge, began to preach in New York and Maryland; and at the conference in 1769, Wesley sent to America two traveling preachers, Richard Boardman and Joseph Pilmoor, to take charge of the societies they had formed. In 1770 he set down in the appointments, "No. 50, America." In 1771 he sent over Francis Asbury and Richard Wright, and in 1773 Thomas Rankin and George Shadford. As the work increased so rapidly in America, as the colonial Church of England, to which the Methodists generally had looked for the sacraments (their own preachers not being empowered to administer them), was virtually extinct, as the English bishops would not ordain ministers for America, and as Wesley had long before ceased "to be theologically or ecclesiastically a High Churchman," and had repudiated the theory of prelatical succession, recognizing the parity of bishops and presbyters as to order, being importuned by the American societies, he provided them with an ordained ministry. In 1784 he ordained Richard Whatcoat and Thomas Vasey as elders, or presbyters, and the Rev. Thomas Coke, a clergyman of the Church of England, as superintendent, or bishop. At a conference in Baltimore Dec., 1784, Bishop Coke, assisted by the Rev. Philip William Otterbein of the German Reformed Church and others, consecrated Francis Asbury bishop, and ordained others as elders, or presbyters, and deacons. Thus originated Methodist *episcopacy*. At first, Wesley, being intensely loyal, wrote against the American "rebellion," but when he saw the hand of God in it, he wrote a powerful letter to Lord North, imploring the Government to stop the war. When, therefore, the colonies had acquired their independence, Wesley was fully prepared to take this important step. Speaking of the American brethren, he said: "We judge it best that they should stand fast in that liberty wherewith God has so strangely made them free." He abridged and modified the liturgy, offices, ordinal, and Articles of the Church of England for the Methodist Episcopal Church in America, as, with some changes, they are used by that Church to this day. This was the crowning act of his life. He ordained a few ministers for special service in England and Scotland, and he would have ordained more of them,

but he wished to keep his connection, as far as possible, within the pale of the national establishment. But for this he would have organized his societies in Great Britain and Ireland into an Episcopal Church, like the Methodist Episcopal Church in America. Wesley's constant prayer was to lay down his body with his charge "and cease at once to work and live." His prayer was answered, for he labored on to the last. It has been well said of him: No man, perhaps, ever accomplished so much. He rode, chiefly on horseback, 5,000 miles, and preached 500 sermons every year for nearly fifty years; arranged and governed his societies, which numbered before his death some 80,000 members; carried on an immense correspondence; read every work of note as it came from the press; wrote commentaries on the Bible, grammars of the Hebrew, Greek, Latin, and French languages, works on logic and philosophy, controversial treatises, journals, sermons, etc., and abridged over 100 volumes for "A Christian Library." His generosity was limited only by his means. In later life, though he realized £20,000 by his writings, his personal expenses did not average £100 a year, and he left nothing at his death. His life was often in danger from the fury of mobs, and his sensitive spirit felt keenly the contempt of the higher classes, his equals, yet he could say, "None of these things move me." He lived in constant activity, cheerfulness, and trust in God. Like the rest of the Wesley family, he was fond of music and poetry. He published several volumes of tunes for the organ and voice, and quite a library of hymns and poems. He wrote elegant hymns himself, and is accredited with the admirable translations from the German, French, and Spanish found in his hymn-books. He was a keen and judicious critic, and many of the hymns of his brother Charles, Dr. Watts, Herbert, and others were greatly improved by his pruning and correction. He married in 1757, Mrs. Mary Vizelle, a woman of cultivation and apparent piety, but she proved a very vixen, who did all in her power to ruin him. He bore her treatment with marvelous forbearance till she finally robbed him of important papers and left him forever, whereupon he calmly said, *Non eam reliqui, non dimisi, non revocabo.* He died in London, Mar. 2, 1791, surrounded by some of his preachers and other friends, exclaiming, "The best of all is, God is with us." He was buried Mar. 9 at City Road chapel, where a marble tablet commemorates his life and labors. On Mar. 30, 1876, a marble tablet to the memory of John and Charles Wesley, showing their profiles, and also representing John Wesley preaching on his father's tomb at Epworth, where he was excluded from the church, was unveiled in Westminster Abbey by Dean Stanley in the presence of the president of the conference, Dr. Jobson, who designed the tablet, and others. See the *Lives* by Hampson, Whitehead, Southey (1820; new ed. 1889); Tyerman (1870; new ed. 1876); Rigg (1875); Watson, with notes by Summers, Telford (1886), Overton (1891); Isaac Taylor's *Wesley and Methodism*; *Journal of John Wesley*, in his *Works*, 7 vols. See METHODISM.

Revised by J. F. HURST.

Wesley, SAMUEL, Sr.: divine; grandson of Bartholomew Wesley, or Westley; b. at Winterborn-Whitchurch, Dorset, 1662; educated at Exeter College, Oxford (B. A., 1688); soon afterward he married Susannah, daughter of Dr. Samuel Annesley, "the St. Paul of the Nonconformists." In 1692 he was appointed to the parish of South Ormsby, in Lincolnshire, where he also acted as domestic chaplain to the Marquis of Normandy, who desired him to be raised to an Irish episcopate, but William and Mary and Archbishop Tillotson disapproved. Having dedicated his *Life of Christ* to Queen Mary, she presented him with the living of Epworth in Lincolnshire, of which he was rector thirty-nine years, and where he died Apr. 22, 1735. He was the father of nineteen children, had to assist poor relatives, met with many reverses, and never had more than £200 a year for his salary. He is frequently described as a Tory and a High Churchman, but he was no Jacobite or bigot. He was the eulogist of William and Mary and Tillotson, who headed the Low-Church party. He was a prolific author. His great works were *The Life of Christ, an Heroic Poem*; *Dissertations on the Book of Job*, in Latin; and *Eupolis's Hymn to the Creator*. As an author he is best known by his two hymns, found in Methodist hymnals, "Behold the Saviour of mankind," and "O Thou who when I did complain." See *Life and Times of the Rev. Samuel Wesley*, by Tyerman; A. Clarke's *Wesley Family*; and the various *Lives* of John and Charles Wesley.

Revised by ALBERT OSBORN.

Wesley, SAMUEL, Jr., A. M.: eldest son of the Rev. Samuel Wesley and brother of John and Charles Wesley; b. in London, Feb. 10, 1690. In 1704 he was sent to Westminster School, where he was admitted in 1707. In 1711 he went to Christ Church, Oxford. After taking his A. M. degree he became usher in his old school at Westminster, and by the advice of his friend Bishop Atterbury entered into holy orders. In 1732 he became head master of Blundell's free grammar school at Tiverton, where he remained till his death Nov. 6, 1739. He was one of the founders of the first infirmary set up at Westminster, now St. George's Hospital. He belonged to the old High Church school, and did not co-operate with his Methodist brothers. He began writing charity hymns when he was about twenty years of age. The first edition of his poems was published in quarto in 1736; a second, with additions, was published in 1743, and an edition was published, with a *Life* of the author, by William Nichols, in 1862. He is best known by his hymns in the Methodist hymn-book, and a poem on the death of a young lady, "The morning flowers display their sweets."

Revised by ALBERT OSBORN.

Wesleyans and Wesleyans, Primitive: See METHODISM.

Wesleyan University: the oldest college under the control of the Methodist Episcopal Church; located at Middletown, Conn. In 1829 a joint committee, appointed by the New York and New England conferences, issued proposals inviting the towns within a specified region to compete for the location of the proposed college by the offer of subscriptions. In response to these proposals two large stone buildings in the city of Middletown, erected five years before for the American Literary, Scientific, and Military Academy, but recently vacated by the removal of that institution to Norwich, Vt., were offered to this committee as a gift, on the condition that an endowment fund of $40,000 should be raised for the college. This offer, accompanied by a subscription of $18,000 from the citizens of Middletown, was at once accepted; the remainder of the $40,000 was raised, and the college organized and chartered under the name of the Wesleyan University. Its first class, numbering 6, was graduated in 1833. In the year 1900 the faculty comprised 35 professors and instructors; the students numbered 340. In 1872 the curriculum was revised and expanded by the introduction of a considerable number of elective studies; indeed, Wesleyan University was one of the first of New England colleges to adopt what may be called the modern college curriculum. The college now offers three courses of study of four years each. In 1872 the doors of the college were opened to women. Within the decade of 1868–78 the material interests of the college were greatly advanced, three elegant buildings being erected—a library, the gift of Isaac Rich., Esq.; the memorial chapel, which commemorates the eighteen alumni and students who fell in the civil war; and the Orange Judd hall of natural science, the gift of him whose name it bears. In 1894 a large modern gymnasium was erected. The total value of the buildings, grounds, and collections of the college, as given in the report of the treasurer made in 1899, was $650,000. The whole amount of its productive property in 1899 was about $1,260,000. The library numbers about 57,000 volumes; the observatory contains a 12-inch refracting telescope by Alvan Clark & Sons; well-appointed laboratories, with chemical and physical apparatus and cabinets, illustrating the departments of geology and natural history, furnish the undergraduate with facilities for the study of physical science. The presidents of the college have been Wilbur Fisk, D. D., 1831–39; Stephen Olin, D. D., LL. D., 1839–41; Nathan Bangs, D. D., 1841–42; Stephen Olin, D. D., LL. D., second term, 1842–51; Augustus William Smith, LL. D., 1851–57; Joseph Cummings, D. D., LL. D., 1857–75; Cyrus D. Foss, D. D., 1875–80; John W. Beach, D. D., LL. D., 1880–87; John M. Van Vleck, LL. D. (acting), 1887–89; and Bradford P. Raymond, D. D., 1889. C. T. WINCHESTER.

Wessel, JOHAN HERMAN: poet; b. in the parish of Vestby, Norway, Oct. 6, 1742. In 1761 he entered the University of Copenhagen, but relinquished his academic studies the following year. The rest of his life he spent at the Danish capital, supporting himself by giving private lessons in the modern languages and leading a purposeless existence. As a result partly of his poverty, partly of delicate health, he early lost his naturally cheerful temperament and sank into a deep melancholy. In 1772 he published anonymously his burlesque tragedy *Kjærlighed uden Strømper* (Love without Stockings), the most original Danish drama since Holberg.

While intended primarily to ridicule the prevailing taste for the artificial French tragedy, which had shortly before been imitated in Nordal Brun's *Zarine*, Wessel's work survived the occasion that gave it special point, as it is also a satire on national affectation in general. His later works, though often displaying keen wit, and occasionally real pathos, are of comparatively slight importance. Neglected by the French-infected court and conscious of the failure of his life, Wessel died at Copenhagen, Dec. 29, 1785. His collected works, edited by J. Levin, appeared in 1862.

D. K. Dodge.

Wessel, *ves'sel*, Johann, also called **Gansfort** (the name of a village from which his family probably came): philosopher; b. at Gröningen, Holland, about 1420; was educated in the school at Deventer, then under the leadership of the celebrated Gerhard Groot, and enjoyed the friendship of Thomas à Kempis, who was sub-prior of the neighboring monastery of Mt. St. Agnes at Zwolle; went to Cologne, where he learned Greek and Hebrew, the Thomist theology, and studied Plato and Augustine; resided for many years at Paris, where he took part with great energy in the controversy between nominalism and realism, on the nominalistic side; became renowned as a teacher, and had among his pupils Reuchlin and Agricola, then taught at Basel, and stayed for some time at Heidelberg, teaching philosophy, but turned more and more decidedly away from the whole scholastic method based on Aristotle, and began to be suspected of holding heretical views; retired finally to his native city, and died there Oct. 4, 1489. According to Ullmann, he was pre-eminently the *theological* forerunner of the Reformation. Personally, he escaped persecutions, but his writings, by which he belongs to the Reformers before the Reformation, were partly burned by the monks. The remaining works were first published by Luther in 1522 under the title *Farrago Rerum Theologicarum*; afterward by Johann Lydius (at Gröningen, 1617). His *Life* has been written by B. Bähring (Leipzig, 1846), and by J. Friedrich (Regensburg, 1862). See also C. Ullmann's *Reformatoren vor der Reformation*, 2d vol. (1842; English translation 1855). Revised by S. M. Jackson.

Wesseling, *ves'sel-ing*, Peter: classical scholar; b. at Steinfurt, Westphalia, Jan. 7, 1692; studied at the Universities of Leyden and Franeker; appointed Professor of Eloquence at Franeker in 1723, at Utrecht in 1735; editor of *Diodorus* (2 vols. folio, 1746), and of *Herodotus* (together with Valckenaer, 1763). He died at Utrecht, Nov. 9, 1764. See I. G. Boot, *De vita et scriptis Wesselingii* (1874); Ruhnken, *Elogium Hemsterhusii*, p. 30. Alfred Gudeman.

Wessex: a kingdom founded by the West Saxons in the southern part of the island of Britain early in the sixth century and forming a part of the so-called Heptarchy (*q. v.*). About 495 two Saxon chieftains, Cerdic and Cynric, led a band of colonists to the coast of what is now Hampshire, and founded there a settlement which in the course of the next twenty-five years became important enough to give its rulers the title of kings. Its dominion was extended westward, and included many of the native Britons as subjects. To the N., however, lay the powerful kingdom of Mercia, which checked the advance of the West Saxons in that direction, seized their possessions N. of the Thames, and at one time threatened them with the permanent loss of their independence; but with the decline of Mercia Wessex stood forth as the leading state in England. Its king, Egbert (800–836), established the West Saxon supremacy, and after him the kingship of Wessex carried with it the rule of all England. F. M. Colby.

Wesson: town (founded in 1866 by J. M. Wesson): Copiah co., Miss.; on the Illinois Cent. Railroad; 46 miles S. of Jackson, the State capital, 135 miles N. of New Orleans (for location, see map of Mississippi, ref. 8–F). It is a summer resort of citizens of New Orleans; is in an agricultural region; and has six churches, large high-school building, a State bank with capital of $30,000, a weekly newspaper, and a manufactory of cotton and woolen goods, having 1,400 operatives and a monthly pay-roll of $25,000. Pop. (1880) 1,707; (1890) 3,168; (1900) 3,279.

Editor of "Mirror."

West, Andrew Fleming, LL. D.: educator and author; b. at Allegheny, Pa., May 17, 1853; educated at Princeton College; classical fellow at Princeton 1874; classical teacher in Hughes High School, Cincinnati, O., 1875–81; principal of Morris Academy, Morristown, N. J., 1881–83; since 1883 Professor of Latin in Princeton College. He has published an edition of *The Andria and Heauton Timorumenos of Terence* (New York, 1888); *The Philobiblion of Richard de Bury* (Grolier Club, New York, 1889); and *Alcuin, and the Rise of the Christian Schools* (New York, 1894). C. K. H.

West, Benjamin: painter; b. at Springfield, Chester co., Pa., Oct. 10, 1738. When a child he showed great disposition for art, and although his parents were Quakers, he was allowed to follow his inclinations. One of his relations took him to Philadelphia, where he received some instruction from William Williams, an artist; then removed to Lancaster, Pa., where he attempted portraiture, and painted a *Death of Socrates*. At the age of eighteen he established himself as a portrait-painter in Philadelphia, but in 1758 removed to New York, and in 1760, through the liberality of merchants in New York and Philadelphia, he went to Rome, where he became known to Mengs and other painters of the time. He painted several pictures there, including a *Cimon and Iphigenia* and an *Angelica and Medora*. He went to England in 1763 and established himself in London, by the advice of Reynolds and Wilson. He painted several pictures for the Archbishop of York, and this brought him to the notice of George III., who made West his historical painter and gave him commissions that occupied the artist from 1769 to 1801. Among the works executed for the king were twenty-eight illustrating the progress of revealed religion, many portraits of members of the royal family, and a *Death of Wolfe*, in which the figures are clothed in the costume of the period, contrary to the practice of the classical school then dominant. In 1768 he aided in founding the Royal Academy of painting, sculpture, and architecture, and in 1792 succeeded Sir Joshua Reynolds as president of this institution. He retained this office almost uninterruptedly for twenty-three years. In 1802 he painted a picture of *Christ healing the Sick in the Temple*, a copy of which is in the Pennsylvania Hospital in Philadelphia. West died in London, Mar. 11, 1820, and was buried in St. Paul's Cathedral. Among his works owned in the U. S. are *Death on the Pale Horse*, in the Pennsylvania Academy, Philadelphia; *Penn's Treaty with the Indians*, in Independence Hall, Philadelphia; and *King Lear*, in the Boston Museum of Fine Arts. A full-length portrait of West, by Sir Thomas Laurence, is in the Wadsworth Gallery, Hartford, Conn. See Galt, *The Life, Studies, and Works of Benjamin West, P. R. A.* (London, 1820); Dunlap, *History of the Rise and Progress of the Arts of Design in the United States* (1834); Tuckerman, *Book of the Artists* (New York, 1867). W. J. S.

West, Stephen, D. D.: clergyman and author; b. at Tolland, Conn., Nov. 13, 1735; graduated at Yale College 1755; studied theology while teaching school at Hatfield, Mass.; became chaplain of Hoosick Fort 1757; succeeded Jonathan Edwards as missionary to the Stockbridge, Mass., Indians 1758; was pastor of the Congregational church at Stockbridge 1759–1818, having resigned the charge of the Indian mission 1770, at which date he adopted the Hopkinsian theological opinions, having previously been an Arminian; was one of the original trustees of Williams College. He was the author of *An Essay on Moral Agency: Remarks on Edwards's Enquiry on Freedom of the Will* (New Haven, 1772; enlarged 1794); *The Duty and Obligation of Christians to Marry only in the Lord* (1779); *An Essay on the Scripture Doctrine of the Atonement* (1785); *An Inquiry into the Ground and Import of Infant Baptism* (1794); *The Life of Rev. Samuel Hopkins, D. D.* (1805); and *The Evidences of the Divinity of Christ* (1816). D. at Stockbridge, May 15, 1819. Revised by S. M. Jackson.

West Bend: city; capital of Washington co., Wis.; on the Milwaukee river, and the Chi. and N. W. Railway; 20 miles W. of Ozaukee, 34 miles N. of Milwaukee (for location, see map of Wisconsin, ref. 6–F). It is in an agricultural and dairying region, and has excellent water-power. There are 6 churches, a public and 2 parochial schools, a private bank, 3 weekly newspapers, foundry and machine-shops, grain elevators, grist-mill, brewery and malt-houses, and harness, pocket-book, and hub and spoke factories. Pop. (1880) 1,273; (1890) 1,296; (1900) 2,119.

Editor of "Democrat."

Westboro: town (incorporated in 1717); Worcester co., Mass.; on the Boston and Albany Railroad; 12 miles E. of Worcester, 32 miles W. by S. of Boston (for location, see map of Massachusetts, ref. 3–F). It has 5 churches, high school, 10 common schools, public library, a State Hospital for the Insane, the Lyman Reform School for boys, a na-

tional bank with capital of $100,000, a savings-bank, 2 hotels, a weekly newspaper, and manufactures of boots and shoes, straw hats, bicycles, bicycle sundries, iron bedsteads, and sleighs. In 1894 it had an assessed valuation of nearly $3,000,000. Pop. (1880) 5,214; (1890) 5,195; (1900) 5,400.
EDITOR OF "CHRONOTYPE."

West Boylston: town (incorporated in 1808); Worcester co. Mass.; on the Boston and Maine Railway; 8 miles N. of Worcester, 40 miles W. of Boston (for location, see map of Massachussetts, ref. 3–G). It contains the villages of West Boylston, Oakdale, Valley, Central, Old Common, West Boylston Station, Lower Factory, and Harrisville; has 4 churches, high school, 15 district schools, public library, and 2 hotels; and is principally engaged in dairying and in the manufacture of cotton goods, boots and shoes, and church organs. In 1894 it had an assessed valuation of about $1,250,000. Pop. (1880) 2,994; (1890) 3,019; (1900) 2,314.

West Branch: village; Ogemaw co., Mich.; on the Mich. Cent. Railroad; 60 miles N. of Saginaw (for location, see map of Michigan, ref. 5–J). It is in a lumbering region, and has 2 private banks and 2 weekly newspapers. Pop. (1880) 139; (1890) 1,302; (1900) 1,412.

West Bridgewater: town (incorporated in 1822); Plymouth co., Mass.; on the N. Y., N. H. and Hart. Railway; 3 miles N. W. of Bridgewater, 25 miles S. of Boston (for location, see map of Massachusetts, ref. 4–I). It contains the villages of West Bridgewater, Cochesett, Matfield, Westdale, and Jerusalem; has 2 churches, high school, 9 district schools, public library, and the Howard Seminary; and is principally engaged in the manufacture of boots, shoes, and machinery. In 1894 it had an assessed valuation of nearly $1,000,000. Pop. (1880) 1,665; (1890) 1,917; (1900) 1,711.

West Bromwich: town of England, in Staffordshire; 5½ miles N. W. of Birmingham, in the center of a rich coal and iron district (see map of England, ref. 10–G). It has large manufactures of glass, gas, and iron goods, firearms, swords, cutlery, and agricultural implements. The borough returns one member to Parliament. Pop. (1901) 65,172.

Westbrook: city; Cumberland co., Me.; on the Presumpscot river, and branches of the Boston and Maine and the Maine Cent. railways; 6 miles N. W. of Portland (for location, see map of Maine, ref. 10–B). The river is capable of developing 9,000 horse-power, and more than half of this amount is utilized in the manufacture of paper, dress silk, ginghams, cotton warp, hosiery, seamless bags, and other articles. The Stroudwater, which flows through the city, is capable of developing additional power. The city is connected with Portland by electric railway, and has 8 churches, full system of public schools, a parochial school, the Walker Memorial Library, a trust company with capital of $50,000, and a weekly newspaper. Pop. (1880) 3,981; (1890) 6,632; (1900) 7,283. EDITOR OF "CHRONICLE."

West Brookfield: town (incorporated in 1848); Worcester co., Mass.; on the Boston and Albany Railroad; 29 miles E. N. E. of Springfield, 69 miles W. by S. of Boston (for location, see map of Massachusetts, ref. 3–F). It is drained by the Chicopee and Ware rivers; contains 2 churches, 9 district schools, and a public library; and is principally engaged in the manufacture of shoes and corsets. Pop. (1880) 1,917; (1890) 1,592; (1900) 1,448.

Westbury, RICHARD BETHELL, Baron: statesman and judge; b. at Bradford, Wiltshire, England, June 30, 1800; graduated at Oxford 1818; became a fellow of Wadham College, studied law, and was admitted (1833) to the bar at the Middle Temple; became distinguished as an equity lawyer; was returned to Parliament in 1832; was made queen's counsel 1840; knighted and appointed Solicitor-General Dec., 1852; carried through the House of Lords the Succession Duty Bill, the Oxford University Reform Bill, the bill for the abolition of ecclesiastical courts, and other important measures; was Attorney-General under Lord Palmerston Nov., 1856, to Feb., 1858; carried, against great opposition, measures for the abolition of the ecclesiastical testamentary courts and for the establishment of the divorce and probate courts, the judgeship of which latter was offered to him, but declined; was a second time Attorney-General, from June, 1859, to June, 1861, when he was raised to the peerage, and became Lord Chancellor under the title of Baron Westbury; assisted in carrying important measures of law reform relating to bankruptcy, landed estates, and professional education; resigned the great seal July 4, 1865. He did much by his decisions as chancellor to mould the development of English equity jurisprudence, and especially in patent law, joint-stock company law, and ecclesiastical appeals. D. July 20, 1873. He left no printed works of any note, except his decisions. F. STURGES ALLEN.

West Chester, borough; capital of Chester co., Pa.; on the Penn., and the Phila., Wilm. and Balt. railways; 16 miles N. of Wilmington, Del., and 27 miles W. of Philadelphia (for location, see map of Pennsylvania, ref. 6–I). It is in an agricultural and mineral region, and contains a State Normal School (building cost $400,000), the Chester County Hospital, the county prison, 3 national banks with combined capital of $525,000, 6 private banks, and a savings-bank. There are 2 Friends' meeting-houses, and a Roman Catholic, 3 Methodist Episcopal, 2 Baptist, and 2 Protestant Episcopal churches, 4 public-school buildings, 2 Friends' schools, a parochial and many private schools, a public library, law library, 2 theaters, and a monthly, 2 daily, and 5 weekly periodicals. Marshall Square contains a unique arboretum, a soldiers' monument, and one of the three handsome fountains which adorn the borough. The industrial establishments include a creamery, cold-storage and ice plants, printery, steam laundry, and manufactories of stockings, separators, carriages, spokes and wheels, umbrella tags, and sash and doors. The borough had an assessed valuation in 1895 of over $6,300,000. Chester County was divided in 1786, when Turk's Head became West Chester, the county-seat of the remaining part of Chester County, and the new county of Delaware retained the old county-seat of Chester. Pop. (1890) 8,028; (1900) 9,524. DANIEL W. HOWARD.

Westcott, BROOKE FOSS, D. D.: bishop and author; b. near Birmingham, England, Jan. 12, 1825; fellow of Trinity College, Cambridge, where he graduated 1848 with honors both in classics and mathematics; took orders in the Church of England 1851; was assistant master of Harrow School 1852–69; became preacher to the University of Cambridge 1859; examining chaplain to the Bishop of Peterborough 1868, canon of Peterborough Cathedral 1869, Regius Professor of Divinity at Cambridge Nov. 1, 1870, honorary chaplain to the Queen Apr., 1875, and Bishop of Durham 1890. He is the author of *Elements of the Gospel Harmony* (1851), being the Norrisian prize essay for the previous year; *A History of the Canon of the New Testament during the first Four Centuries* (1855; 5th ed. 1881); *Characteristics of the Gospel Miracles*, being sermons preached before the University of Cambridge (1859); *An Introduction to the Study of the Gospels, with Historical and Explanatory Notes* (1860; 6th ed. 1882); *The Bible in the Church, a Popular Account of the Collection and Reception of the Holy Scriptures in the Christian Churches* (1864; 9th ed. 1885); *The Gospel of the Resurrection, Thoughts on its Relation to Reason and History* (1866; 5th ed. 1884); *A General View of the History of the English Bible* (1868; 2d ed. 1879); commentaries on John's Gospel (Speaker's Commentary), John's Epistles (1883; 2d ed. 1886), and Hebrews (1889); and several volumes of sermons and minor works. With Dr. Hort he edited the monumental edition of the Greek New Testament from the oldest authorities (2 vols., 1881).
Revised by S. M. JACKSON.

Westcott, EDWARD NOYES: See the Appendix.

West Chicago: See TURNER, ILL.

West Duluth: village; St. Louis co., Minn.; on St. Louis Bay, and the St. P. and Duluth and the Duluth Transfer railways; 4 miles S. W. of Duluth (for location, see map of Minnesota, ref. 6–G). It has a State bank with capital of $50,000, a weekly newspaper, and a number of factories. Pop. (1890) 3,368; now a part of Duluth.

Westerly: town; Washington co., R. I.; on the Pawcatuck river, and the N. Y., N. H. and Hart. Railroad; 5 miles N. of Long Island Sound (for location, see map of Rhode Island, ref. 11–L). It contains the villages of Westerly, White Rock, Potter Hill, Niantic, and Avondale, each having a post-office, and the summer resorts of Watch Hill and Noyes's Beach. The town was originally known by the Indian name Misquamicut; was incorporated May 14, 1669, as the fourth town in the colony and under its present name; and had its name changed to Haversham in 1686 and again to Westerly in 1689. The principal industries are granite-quarrying, for which the town is widely noted, and the manufacture of cotton and woolen goods. Pop. (1880) 6,104; (1890) 6,813; (1900) 7,541.

WESTERLY.—Principal village in town of the same name; situated 5 miles from the mouth of the Pawcatuck river, which

here divides the States of Rhode Island and Connecticut; 44 miles S. W. of Providence. It has water-works, gas, electric-light, and electric street-railway plants, 10 churches, public library in Soldiers' Memorial building, 4 hotels, 4 national banks, 4 savings-banks, cotton, woolen, thread, silk, and planing mills, machine-shop, printing-press factory, numerous granite quarries, a weekly and 2 daily newspapers, and is a distributing point for S. Rhode Island and E. Connecticut.

GEORGE H. UTTER, EDITOR OF "DAILY SUN."

Westermann, ANTON: classical scholar; b. in Leipzig, Germany, June 18, 1806; studied at the university; privat docent 1830, professor extraordinary 1833, ordinary 1834; resigned 1865. D. in Leipzig, Nov. 24, 1869. He was a learned and prolific writer. His chief works are *Geschichte der Beredsamkeit in Griechenland und Rom* (2 vols., 1835); *Paradoxographi* (1839); *Mythographi* (1843); *Biographi Græci* (1845); edited Pseudo Plutarch's *Vitæ X Oratorum*; Stephanus Byzantius; Heracliti *Epistolæ*; *Lysias*; selected *Orations* of Demosthenes (often re-edited). He also wrote *Quæstiones Demosthenicæ* (4 pts., 1837); *Untersuchungen über die in die attischen Reden eingelegten Urkunden* (1850); *Index Græcitatis Hyperideæ* (1864); re-edited Vossius's *De historicis Græcis*; and translated Leake, *The Demes of Attica*. See Bursian, *Geschichte der klassischen Philologie in Deutschland*, pp. 890–894. ALFRED GUDEMAN.

Western Australia: the westernmost of the seven Australasian colonies, the first in area and last in population; comprising the whole of Australia W. of the meridian of 129° E., which separates it from South Australia; area estimated at 975,876 sq. miles, or about one-third of the Australian continent. A large proportion of this area is in heavy timber—sandalwood; the jarrah, the karri, the tuart, and other species of Eucalyptus. The coasts are estimated at 3,000 miles in length, but good harbors are few. The habitable part of the colony is confined to the coast, along which the settled portion stretches for 1,200 miles and from which it extends inland for about 150 miles. The climate is salubrious and enjoyable, the average temperature at the capital being 64° F. and the rainfall 34 inches. The extreme northern part of the colony, called the Kimberley district, is of tropical character; is rich in minerals; and the interior appears less arid. The rivers of the entire colony are short, and not suitable for navigation. Agriculture is at present possible over only a small fraction of the colony, owing chiefly to lack of labor. In 1895 only 331 sq. miles were under cultivation, or about one part in 2,948. The live stock in 1895 consisted of 58,506 horses, 200,091 horned cattle, and 2,229,832 sheep. It is estimated that in the north there are 20,000,000 acres of fairly watered pasture-land affording good grazing. Gold is worked in the north and in the southwest, and is found in many other parts of the colony. The export of gold in 1893 amounted to 110,890 oz., valued at £421,385, and the production has greatly increased of late years. There are also mines of silver, copper, lead, and tin, and the prospective mineral wealth is very great. The chief export is wool; then come gold, pearls and pearl-shell, timber and sandalwood, and skins. The total value of the exports in 1893 was £918,147, and of the imports £1,494,438. There were 1,184 miles of railway open for traffic at the end of 1894, and a scheme is on foot to connect this colony with South Australia by rail, as it has already been connected by telegraph. There are 3,578 miles of telegraph line, with 4,303 miles of wire. The legislative power rests in an elective parliament of two houses, and the executive in a governor appointed by the British crown and assisted by a responsible ministry. It became a self-governing colony in 1890, and both houses became fully elective in 1893. The entire population in 1891 was 49,782—29,807 males and 19,975 females. These figures do not include the aborigines, whose total number can not be estimated with any approach to accuracy. There were 5,670 of them employed as servants in 1891. At the end of 1893 the population was estimated at 65,064, of whom 12,424 were in Perth, the capital, and 8,000 at Fremantle, its port. See Hart, *Western Australia in 1893* (1894); Mennell, *The Coming Colony* (1894).

MARK W. HARRINGTON.

Western College: an institution under the control of the United Brethren in Christ; founded in 1856. It was located in Western, Linn co., Ia., and was removed to Toledo, Tama co., Ia., in 1881. It is supported by six co-operating conferences. These are in Iowa, Wisconsin, Minnesota, Illinois, and Colorado. The main college is 150 by 80 feet, three stories high, with a basement. It contains recitation-rooms, society-rooms, lecture-room, library, and laboratories. The college has two boarding-halls and the Bright memorial conservatory building. The faculty, headed by L. Bookwalter, A. M., D. D., as president, consists of six professors, assisted by resident lecturers, tutors, and instructors. There are six courses of study, with subordinate departments of music, business, elocution, and art. Both sexes are admitted on equal terms. In 1900 there were 14 instructors, 278 students, and 5,000 volumes in the library. L. BOOKWALTER.

Western Dwina: See DWINA.

Western Empire: a name sometimes applied to the western provinces of the Roman empire between the years 395 and 476. The term is misleading, for, while in this period there were two emperors, one of whom resided in Italy and had direct control over the western provinces, the empire remained in theory one, and the acts of each emperor were binding through the whole empire. C. H. H.

Western Islands: See AZORES.

Western Reserve University: an institution founded in Cleveland, O., in 1884. This step was taken by the trustees of Adelbert College, and most of the trustees of the college are also trustees of the university. The object of the organization was to effect a confederation of several institutions either already existing or to be erected, under one general management and control. The university now embraces the following departments:

1. Adelbert College, the academical department, under its old charter, but operated in unison with the methods and aims of the university. See ADELBERT COLLEGE.

2. The college for women, organized in 1888 by the university, and in full operation, with thirteen professors and instructors, and a course of study on the same grade as that of Adelbert. It has $172,000 endowment, and grounds and buildings worth $120,000 more.

3. The college of medicine, formerly known as the Cleveland Medical College, organized in 1844 as the medical department of Western Reserve College, and transferred to the university in 1884. It has twenty-four professors and instructors, a four-years' graded course; occupies a building erected for it by John L. Woods, at a cost of about $250,000. It has also a permanent fund amounting to $150,000, and operates a dispensary with $50,000 endowment.

4. The college of dentistry, established in 1892. This has nine professors and instructors, and a constantly growing body of students.

5. The college of law, opened in 1892. It has ten professors and instructors, with the support and co-operation of the Cleveland bar.

6. The graduate department, opened in 1892. Under the direction of the faculties of Adelbert College and the college for women.

7. The Western Reserve Academy, at Hudson, O., preparatory and classical school, belonging to Adelbert College.

All these departments have courses of study leading to degrees. The whole number of students in 1900–01 was 802. The president of the university is Rev. Charles F. Thwing, D. D., LL. D. E. BUSHNELL, SECRETARY AND TREASURER.

Westerville: village (platted in 1854); Franklin co., O.; on the Alum creek, and the Cleve., Akron and Col. Railway; 12 miles N. of Columbus, with which it is connected by electric railway (for location, see map of Ohio, ref. 5–E). It is in an agricultural region; has 6 churches, several public schools, a private bank, and a weekly and 2 monthly periodicals; and contains saw, planing, and flour mills, large broom-factories, brick and tile works, and manufactories of wagons and stump-pullers. Westerville is the seat of Otterbein University (United Brethren, opened in 1847), which in 1894 had 18 instructors, 274 students, and 6,000 volumes in its library. Pop. (1880) 1,148; (1890) 1,329; (1900) 1,462.

PUBLISHERS OF "PUBLIC OPINION."

West Farnham, or **Farnham**: an important railway center on the Canadian Pacific and Central Vermont railways; near the junction of the two main branches of the Yamaska river, Canada; about 39 miles from Montreal (see map of Quebec, ref. 6–B). The water-power is excellent though not fully utilized. The place has a fine railway station, a model school, Church of England and Methodist churches, and a Roman Catholic church with a convent and college. An iron bridge spans the river. There is an extensive building for the manufacture of beet-root sugar. The local trade is kept active by the export of agricultural products and the railway machine-shops. Pop. (1891) 2,822. J. M. HARPER.

Westfield: town (old Indian name, Woronoco); Hampden co., Mass.; on the Westfield river, and the Boston and Albany and the N. Y., N. H. and Hart. railways; 9 miles W. of Springfield, 108 miles W. by S. of Boston (for location, see map of Massachusetts, ref. 3–D). It lies in a picturesque valley, is laid out with broad streets and avenues, and has a large public park, Woronoco, possessing many natural advantages. There are 8 churches, one of the largest public high-school buildings in the State, a State normal school (building cost $150,000), several district schools, kindergarten and primary schools connected with the normal school, and public library of over 15,000 volumes, 2 national banks with combined capital of $400,000, 2 savings-banks with combined deposits of over $2,250,000, and 3 weekly newspapers. The public-school system costs $40,000 annually. The town has an excellent water-supply, obtained from Montgomery Mountain, 7 miles distant. The plant was completed in 1874 at a cost of nearly $250,000. It also has an extensive sewerage system. Westfield is noted as a manufacturing place, particularly of whips. Other important manufactures are organs, steam-heaters, cigars, paper, thread, and brick. In 1894 the town receipts were $278,737; expenditures, $227,349; net debt, $289,200; and assessed valuation, nearly $8,000,000. Pop. (1880) 7,587; (1890) 9,805; (1900) 12,310.
M. L. Clark.

Westfield: village; Union co., N. J.; on the Cent. Railroad of N. J.; 7 miles W. of Elizabeth, the county-seat, and 19 miles S. W. of New York (for location, see map of New Jersey, ref. 3–D). It is attractively laid out on an elevated site as a residential place, and has a Netherwood water system, electric lights, and macadamized roads. There are Baptist, Congregational, Methodist Episcopal, Presbyterian, Protestant Episcopal, and Roman Catholic churches, 2 public and 2 private schools, a national bank with capital of $50,000, a building and loan association, an athletic club-house, and 2 weekly papers. Pop. (1880) 2,216; (1890) 2,739; (1900) 4,328. Editor of "Union County Standard."

Westfield: village (incorporated in 1833); Chautauqua co., N. Y.; on the Chautauqua creek, and the Lake Shore and Mich. S. and the N. Y., Chi. and St. L. railways; 17 miles S. W. of Dunkirk, 59 miles W. of Buffalo (for location, see map of New York, ref. 6–B). It has 6 churches, a union school and academy with two endowed scholarships, gravity water system and electric-light plant (both owned by the village), public library founded by Hannah Patterson with $100,000, railway-shops, a national bank with capital of $50,000, and a weekly and a monthly periodical. The surrounding country is devoted almost exclusively to grape-culture. Pop. (1880) 1,924; (1890) 1,983; (1900) 2,430.
Editor of "Republican."

Westfield: borough; Tioga co., Pa.; on the Cowanesque river, and the Fall Brook and the Addison and Penn. railways; 26 miles N. by W. of Wellsboro, the county-seat, and 58 miles N. of Lock Haven (for location, see map of Pennsylvania, ref. 2–F). It is in an agricultural and dairying region, and has a private bank and a weekly newspaper. Pop. (1880) 579; (1890) 1,128; (1900) 1,180.

Westfield River: a river that rises by three branches (the north, middle, and west branch) in the Green Mountains and their foothills in Berkshire and Hampshire cos., Mass. The main stream begins at Huntington, Mass. Throughout most of its course it is turbulent, affording good water-power. It finally runs southeastward and joins the Connecticut opposite Springfield, Mass. In its lower course it is often called the *Agawam*.

Westford: town (incorporated in 1729); Middlesex co., Mass.; on the Boston and Maine and the Concord and Montreal railways; 6 miles S. W. of Lowell (for location of county, see map of Massachusetts, ref. 2–H). It contains the villages of Westford, Central Village, Graniteville, Forge, Brookside, Westford Corner, and Parkerville; has 4 churches, 15 district schools, and public library; and is principally engaged in agriculture, granite-quarrying, and the manufacture of machinery and woolen goods. In 1894 it had an assessed property valuation of $1,146,688. Pop. (1880) 2,147; (1890) 2,250; (1900) 2,624.

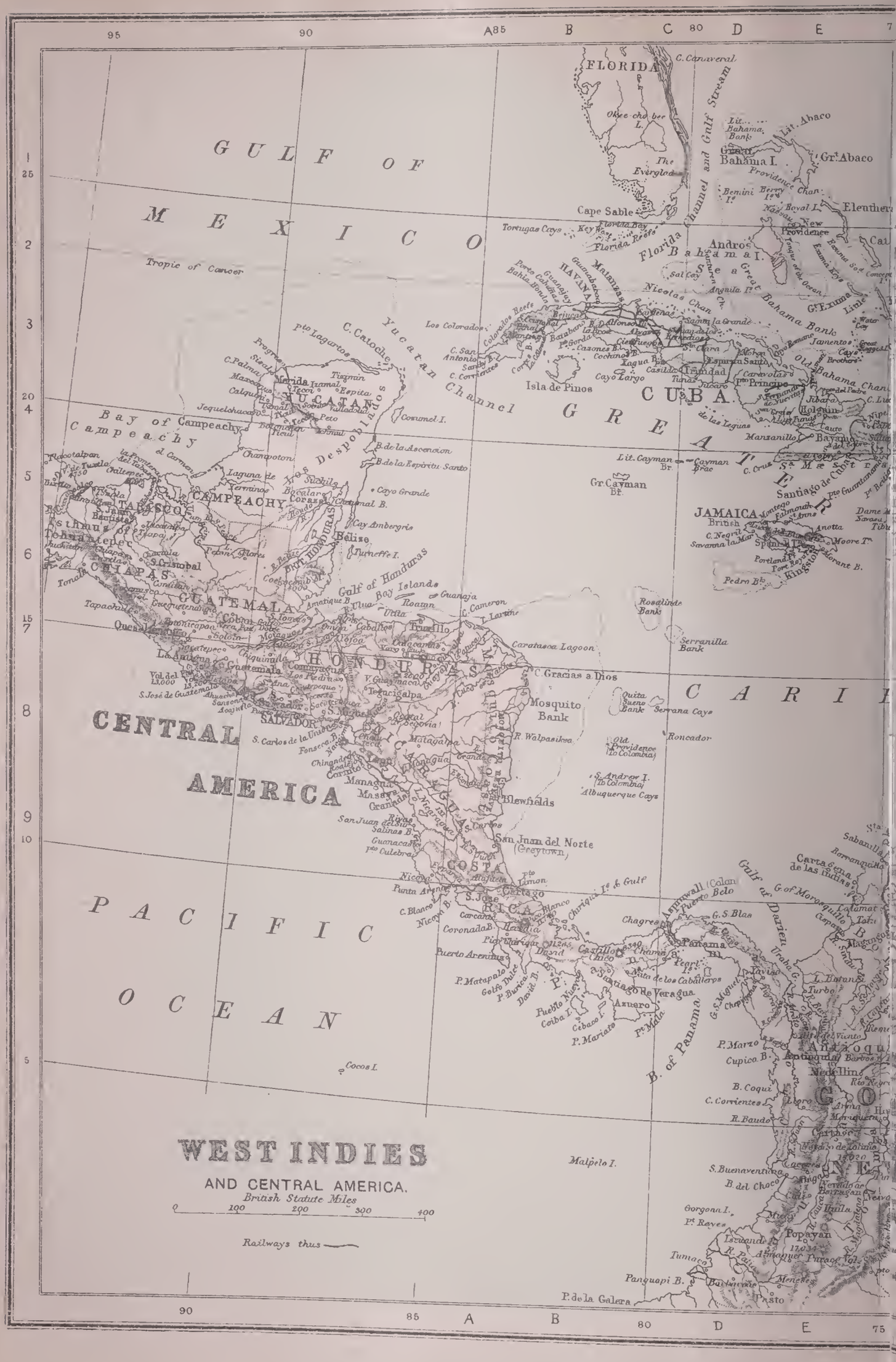
West Grove: village; Chester co., Pa.; on the Phil., Wil. and Balt. Railroad; 40 miles S. W. of Philadelphia (for location, see map of Pennsylvania, ref. 6–I). It has extensive rose-nurseries, casket and knitting factories, a national bank with capital of $50,000, and a weekly and a monthly periodical. Pop. (1890) 1,521; (1900) 929.

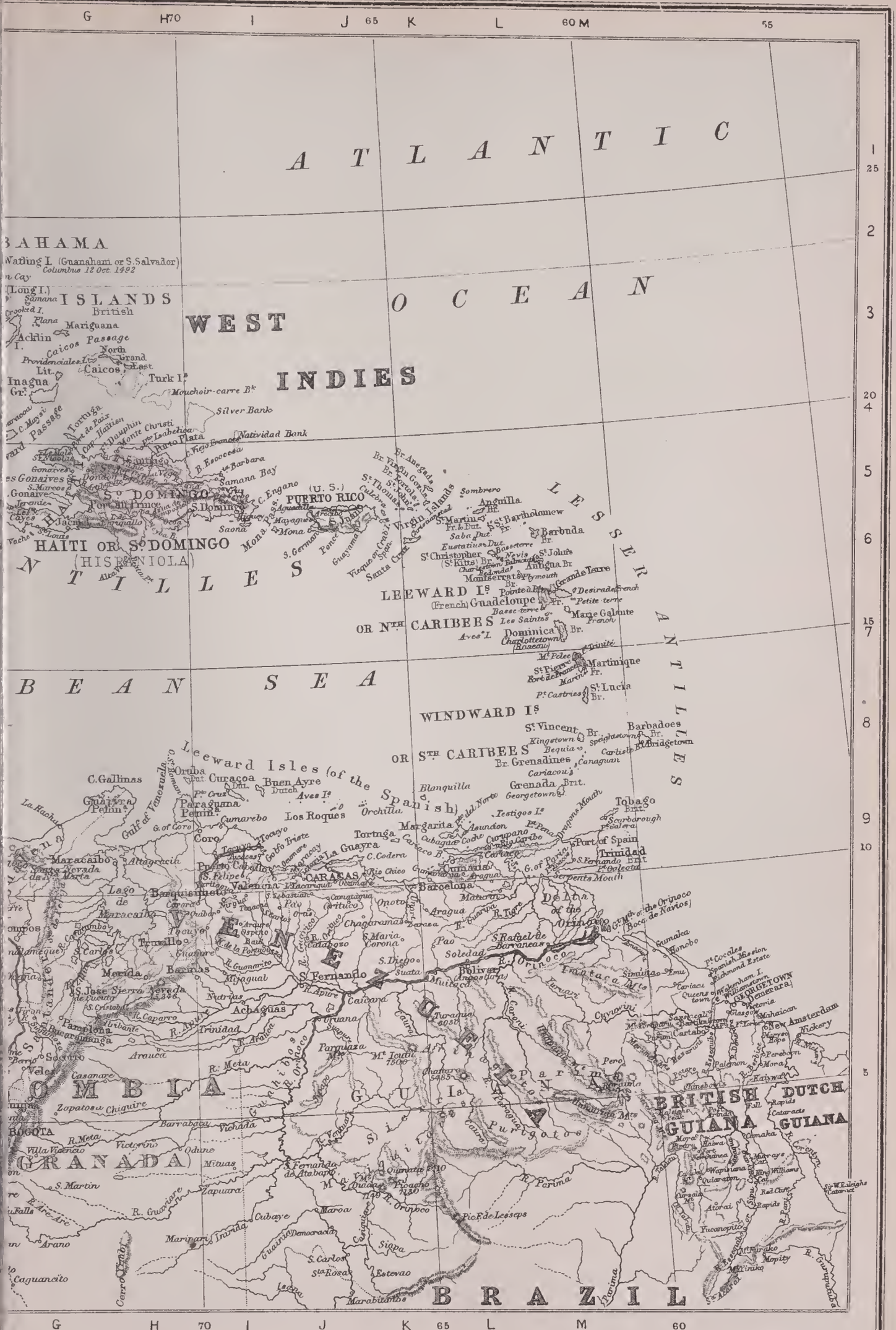
West Hartford: town (incorporated in 1854); Hartford co., Conn.; on the north and south forks of Park river, and the N. Y. and New Eng. Railroad; 5 miles W. of Hartford (for location, see map of Connecticut, ref. 8–G). It was set off from the town of Hartford; contains the villages of West Hartford and Elmwood; and has four churches, a public library, high school, electric railway connecting with Hartford, Farmington, and Unionville, and pipe-bending and brick and pottery works. In 1894 the grand list was $2,752,626. Pop. (1890) 1,930; (1900) 3,186. C. W. Manwaring.

West Hoboken: town; Hudson co., N. J.; 160 feet above tide-water; 1½ miles W. of Hoboken ferry on the Hudson river, directly opposite New York (for location, see map of New Jersey, ref. 2–E). It has 5 churches, 4 public schools, Roman Catholic school, a monastery of the Passionist Fathers, convent of the Sisters of St. Dominic, Masonic hall, a trust and savings institution with capital of $125,000, and 2 weekly newspapers. It is principally engaged in the manufacture of silk goods, for which there are five plants. Pop. (1880) 5,441; (1890) 11,665; (1900) 23,094.
George E. Reynolds, surveyor.

West India Company, Dutch: See Dutch West India Company.

West Indies: an archipelago forming a curved chain from Florida and Yucatan to the northern coast of South America, framing the Caribbean Sea on the N. and E., and separating it from the Gulf of Mexico and the Atlantic. The islands fall naturally into four groups—the Bahamas, the Greater Antilles, the Caribbean chain, and the Venezuelan or Leeward group. The Bahamas are clustered irregularly along a line beginning E. of Southern Florida (separated by the Florida Channel) and extending southeastward almost to the coast of Santo Domingo. They include some twelve or fifteen larger and a multitude of smaller islands, generally connected with each other by shallows or "banks." Some of them have hills of no great height, but portions of all are formed of consolidated shell and coral sand. The group is, in fact, a reef formation gathered about a skeleton of older land; it may be regarded as an outlying portion of the Florida peninsula. The Bahamas lie partly to the N. of the tropic, but the Gulf Stream sweeps past and through them on its way to the Atlantic, warming the air, so that the climate and productions of all are essentially tropical. The name Greater Antilles is commonly used to distinguish Cuba, Santo Domingo, Puerto Rico, and Jamaica, the largest of the West Indian islands; physically the group also includes some smaller islands near these—Mona, Isle of Pines, Tortuga, the Caymans, etc. They are essentially different in character from the Bahamas, being formed in great part of mountain chains. In some places—especially in Santo Domingo—the mountains rise in splendid precipices from the sea; elsewhere they slope back through verdant valleys to interior ranges 8,000 to 10,000 feet high. It is said that an English admiral, to illustrate the appearance of Santo Domingo, crumpled a sheet of paper in his hand and threw it on a table; and the figure would be equally apt for Cuba or Jamaica. Two principal east and west chains may be traced—one running through Cuba and along the northern side of Santo Domingo, and the other on the southern side of Santo Domingo, reappearing in the Blue Mountains of Jamaica. The significant fact was first noticed by Humboldt, that the northern chain is on a line with the east and west Anahuac range of Mexico, which embraces the highest peaks and nearly all the volcanoes of that country. Continued still farther W. the line strikes the volcanic Revillagigedo islands in the Pacific. (See Mexico.) It should be noted, however, that the Greater Antilles contain no active nor recent volcanoes, though the frequency of earthquakes shows that they are on a line of volcanic disturbance. In Puerto Rico the mountainous character is much less marked, and E. of it the scattered group called the Virgin islands is rocky and precipitous, but of no great height; it may be included either in the Greater Antilles or in the Caribbean chain. The latter (called also the Lesser Antilles or Windward islands) departs abruptly from the east and west trend of the Greater Antilles, and belongs, in fact, to a different mountain system. The islands are small but generally high —2,500 to 4,000 feet—forming a very regular, slightly curved north and south line on the eastern side of the Caribbean Sea; nearly every one contains an active, quiescent, or extinct volcano. The group is, in fact, a chain of volcanic mountains, partially submerged, so that the islands are frequently separated by very deep channels. Barbados alone


WEST INDIES
AND CENTRAL AMERICA.
British Statute Miles
0 100 200 300 400
Railways thus
GULF OF MEXICO
CENTRAL AMERICA
PACIFIC OCEAN
CARIBBEAN SEA
GREAT ANTILLES
CUBA
JAMAICA
FLORIDA
YUCATAN
CAMPECHY
TABASCO
CHIAPAS
GUATEMALA
HONDURAS
SALVADOR
NICARAGUA
COSTA RICA
PANAMA
Bay of Campeachy
Gulf of Honduras
Mosquito Bank
Tropic of Cancer
Florida Channel and Gulf Stream
Yucatan Channel
Old Bahama Channel
Isla de Pinos
Cayman Br.
Gr. Cayman
Jamaica British
Santiago de Cuba
Havana
Cape Sable
Andros I.
Gr. Abaco
Gr. Bahama I.
Cocos I.
Malpelo I.
Gulf of Darien
B. of Panama
Panama
Chagres
Aspinwall (Colon)
Puerto Belo
Cartagena de las Indias
Medellin
Antioquia
Popayan
Pasto
Panquapi B.
P. de la Galera
Tumaco
Buenaventura
Cartago
San Juan del Norte (Greytown)
Blewfields
Roncador
Serranilla Bank
Roseblade Banks
Caratasca Lagoon
C. Gracias a Dios
Tegucigalpa
Guatemala
San José de Guatemala
Merida
Campeachy
Belize
Turneffe I.
Cayo Grande
Cayo Ambergris
Cozumel I.
Tuxtla
Oaxaca
Tehuantepec
Isthmus of
Vera Cruz
Tampico
Mexico
Havana
Nicolas Chan
Great Bahama Bank
Old Bahama Chan.
Florida Bay
Tortugas Cays
Key West
Cayo Largo
Sal Key
Anguila I.
Providence
Nassau
Exuma
Eleuthera
Abaco
Lit. Bahama Bank
Lit. Cayman Br.
Pedro B.
Morant B.
Portland Pt.
Kingston
Savanna la Mar
Cape Cruz
Cape Maisi
Cap Tiburon
Cap Dame Marie
Port au Prince
Gonaives
Jacmel
Aux Cayes
Jeremie
Port Royal
Cape Antonio
Cape Corrientes
Cape Catoche
Cape Gracias a Dios
Cape San Antonio
Cape Sable
Cape Blanco
Cape Mariato
Cape Gallinas
Cape Tiburon
Cape Cruz
Cape Maisi
Cape Antonio
Cape Corrientes


ATLANTIC OCEAN
WEST INDIES
BAHAMA ISLANDS
Watling I. (Guanahani or S. Salvador)
Columbus 12 Oct. 1492
British
Mariguana
Caicos Passage
North Caicos
Grand Caicos
Turk I.
Mouchoir-carre Bk
Silver Bank
Navidad Bank
Tortuga
Port de Paix
Cap Haïtien
Dauphin
Monte Christi
Puerto Plata
Samana Bay
Saona
Mona Pass
Mona
PUERTO RICO (U. S.)
Arecibo
Mayaguez
S. German
Ponce
Guayama
Vieque or Crab
Culebra
Virgin Islands
Sombrero
Anguilla
St. Martin
St. Bartholomew
Barbuda
Saba
Eustatius
St. Christopher (St. Kitts)
Nevis
St. Johns
Montserrat
Antigua
Grande Terre
Pointe à Pitre
Guadeloupe (French)
Basse-terre
Les Saintes
Marie Galante
Dominica
Charlottetown (Roseau)
Aves I.
Trinité
Martinique
St. Pierre
Fort de France
St. Lucia
Pt. Castries
LESSER ANTILLES
LEEWARD Is OR Nth CARIBBEES
WINDWARD Is OR Sth CARIBBEES
St. Vincent
Kingstown
Barbadoes
Bridgetown
Bequia
Grenadines
Canouan
Carriacou
Grenada
Georgetown
Tobago
Scarborough
Port of Spain
Trinidad
HAITI OR Sto DOMINGO (HISPANIOLA)
Sto DOMINGO
Port au Prince
S. Domingo
Jacmel
Les Cayes
Gonaives
Cap Haïtien
Mole St. Nicolas
Tortuga
Vache I.
Alto Velo
Saona
Mona
Anegada
Tortola
Virgin Gorda
Leeward Islands (of the Spanish)
Oruba
Curaçoa
Buen Ayre
Aves Is
Blanquilla
Orchilla
Los Roques
Testigos Is
Margarita
Asuncion
Tortuga
Cubagua
Coche
Cumana
Cariaco
Barcelona
Cumarebo
Coro
Paraguana
Guajira Penin.
C. Gallinas
Gulf of Venezuela
Maracaibo
Lago de Maracaibo
Merida
Trujillo
Barquisimeto
Valencia
CARACAS
La Guayra
Puerto Cabello
Tocuyo
Coro
Barinas
Mijagual
Achaguas
Trinidad
Pamplona
Bucaramanga
Socorro
Vélez
Casanare
Zopatosa
Chiguire
Barrabacua
Vichada
Villa Vicencio
Victorino
Odiane
Mituas
Zapuara
Cubaye
Marinero
Iruma
Caguancito
Arano
Cerro Urale
Maroa
Democracia
Sipa
S. Carlos
Sta. Rosa
Estevao
Marabitanas
Pico de Leescps
Pico Duida
Pico Maraco
Pico Parima
Pico Yaviti
Pico Yaviti
Pico Tamacuari
Pico Neblina
Pico Cucuy
Pico Tapirapeco

is outlying, to the E.; it is comparatively flat, and probably belongs to the fourth group, or that forming an east and west line off the coast of Venezuela. Its islands are properly outlying portions of the South American continent. Trinidad and Tobago, as well as Barbados, are generally classed with the Caribbean group, but by their animals and plants as well as by their physical characters, they are clearly South American. The remaining islands—Margarita, Curaçoa, Oruba, etc.—are sometimes called collectively the Leeward islands, though this name is more commonly applied to a British colony forming a portion of the Caribbean group. Nearly all the West Indian islands are fertile, abundantly watered (except a few of the smaller and low ones), and well adapted for the culture of sugar-cane, tobacco, coffee, and cacao, which form the staple products and exports. Beyond a little gold in the Greater Antilles, copper in Cuba, and asphalt in Trinidad, they have no mineral wealth, but their forests are rich in cabinet woods and drugs. The climate of all is essentially the same—tropical, but free from extreme heat even in the summer months, and generally salubrious except in a few coast towns where yellow fever is endemic. The warm and rainy season is from June to October, and this is the time of hurricanes, to which all but the most southerly islands are occasionally subject. During the winter months the West Indies are deservedly popular resorts for tourists and invalids.

History.—Columbus, seeking a westward route to Asia, first saw the land of the New World in one of the Bahamas (Oct., 1492). Subsequently he discovered all of the Greater Antilles, and many of the smaller islands. As they were then supposed to be outlying portions of Asia or "The Indies," they were called West Indies—i. e. those which had been reached by sailing westward, in contradistinction to the East Indies which soon after were reached by an eastwardly route around the Cape of Good Hope. The first Spanish settlement in the New World was on the island of Santo Domingo (1493), and from it, directly or indirectly, nearly all the other Spanish conquests radiated. The Spaniards also settled Cuba, Jamaica, and Puerto Rico, and they had a small colony on Trinidad; but from the first they despised the smaller islands, and after the rich discoveries in Mexico and Peru the West Indies were neglected and partially depopulated. During the seventeenth century various French, English, and Dutch adventurers settled in the Caribbean islands and the Bahamas, and the Spaniards made only feeble attempts to dislodge them. In 1640 the sugar-cane began to be planted systematically, and led to wonderful prosperity, which attracted crowds of immigrants, 50,000 British subjects arriving in Barbados alone in one year. Jamaica was seized in 1655 by the English, who have held it ever since. Bands of adventurers and freebooters, drawn together by their common hatred of the Spaniards, at length formed the roughly organized body called the buccaneers, with their principal stronghold in Tortuga; thence they ravaged the towns of the Greater Antilles and the Spanish Main, eventually crossing the Isthmus of Panama to the Pacific. French buccaneers from Tortuga passed over to the western part of Santo Domingo, which was soon recognized as a French colony. (See the article BUCCANEER.) In 1660 a division of the islands was agreed upon between England and France, but this arrangement was of little avail to prevent frequent violent changes of ownership resulting from European wars. Subsequent events, growing out of the French Revolution, led to the independence of Santo Domingo, and it is now divided between the republic of HAITI and the DOMINICAN REPUBLIC (*qq. v.*). The Bahamas were settled and retained by the English. During the wars of the eighteenth and early part of the nineteenth centuries the Caribbean islands frequently changed hands, either by conquest or treaty; the greater part now belong to Great Britain. France holds Martinique, Guadeloupe, and some smaller islands; Denmark has three islands in the Virgin group; the Netherlands retain Curaçoa and some neighboring islets, with a settlement in the Caribbean group; and Venezuela holds Margarita and some of the other islands near her coast. All the possessions of Spain in the West Indies were relinquished by the treaty of peace with the U. S. in 1898. African slaves were early introduced in most of the islands, and their (freed) descendants of Negro or mixed blood form a large proportion of the population. Of the Carib and other Indian tribes which occupied the islands before the Spanish conquest only insignificant remnants survive. Some of the islands under British dominion have imported large numbers of Hindu coolies as workmen.

The following table exhibits the approximate areas and the populations (1890 or 1891) of the various political divisions:

NATIONALITIES.	Islands and dependencies.	Area in sq. miles.	Population.
Spanish	Cuba and dependencies	43,220	1,631,687
	Puerto Rico and dependencies	3,714	807,708
British	Bahamas	5,450	48,000
	Jamaica and dependencies	4,492	648,498
	Leeward islands	701	127,723
	Windward islands	507	137,824
	Barbados	166	182,322
	Trinidad and Tobago	1,868	218,415
Danish	St. John, St. Thomas, and Santa Cruz	127	32,786
Dutch	Curaçoa and dependencies	403	45,162
French	Martinique	381	177,000
	Guadeloupe and dependencies	722	165,899
Venezuelan	Margarita	450	40,000
Dominican	Santo Domingo	18,045	610,000
Haitian	Santo Domingo	10,204	572,000
Total of West Indies		90,450	5,445,024

AUTHORITIES.—For history, the works of Bryan Edwards, T. Southey, and T. Coke. For geography, Reclus, *The Earth and its Inhabitants*, and references given under articles on the various islands. HERBERT H. SMITH.

Westlake, JOHN: See the Appendix.

West Liberty: town (founded in 1855); Muscatine co., Ia.; on the Burl., Cedar Rap. and N. and the Chi., Rock Isl. and Pac. railways; 16 miles S. E. of Iowa City, 38 miles W. by N. of Davenport (for location, see map of Iowa, ref. 6–K). It is in an agricultural, dairying, and stock-raising region; has four churches, high and primary schools, a State bank, a private bank, and a weekly newspaper; and contains a creamery, carriage-factory, and brick and tile works. It is an important shipping-point for choice stock, horses, cattle, and hogs. Pop. (1900) 1,690.

West Liberty: village; Liberty township, Logan co., O.; on the Mad river, and the Cleve., Cin., Chi. and St. L. Railway; 8 miles S. of Bellefontaine, 10 miles N. of Urbana (for location, see map of Ohio, ref. 4–D). It has good water-power, several flour-mills and machine-shops, public high school, an incorporated bank with capital of $15,000, a private bank, and a weekly newspaper. Pop. (1880) 715; (1890) 1,200; (1900) 1,236.

West'macott, Sir RICHARD, R. A.: sculptor; b. in London, England, in 1775, son of a sculptor, from whom he learned the rudiments of his art; studied under Canova at Rome 1793–97; obtained the first premium from the Academy of Florence 1794; became an associate of the Royal Academy 1805, and an Academician 1816; succeeded Flaxman as Professor of Sculpture at the Royal Academy 1827, and was knighted 1837. Among his most noted statues are those of Addison, Pitt, Fox, Erskine, Nelson, the Dukes of Bedford and York, that of Achilles in Hyde Park and of George III. at Windsor, and those of Cupid and Psyche in the possession of the Duke of Bedford. Other works are an alto-rilievo, *The Dream of Horace*, numerous monuments in St. Paul's Cathedral and Westminster Abbey, and the groups of sculpture on the marble arch at Cumberland Gate and the pediment of the British Museum. D. in London, Sept. 1, 1856. Revised by RUSSELL STURGIS.

Westmacott, RICHARD, R. A., F. R. S.: sculptor; son of Sir Richard Westmacott; b. in London, England, in 1799; studied sculpture under his father; was in Italy 1820–26; was in general an imitator of his father's style, but with a preference for mythological and religious compositions; was elected associate 1838, and Academician 1849, and succeeded his father as Professor of Sculpture 1857. D. in London, Apr. 19, 1872.

West'meath: an inland county of Ireland, province of Leinster, bordering on the Shannon. Area, 708 sq. miles. The surface is hilly, especially in the northern part, and much diversified by lakes, rivers, and forests. The soil is fertile, but only a small part of it is under tillage. Oats and potatoes are the common crops, and breeding and fattening of cattle is the principal occupation. Pop. (1891) 65,028. Chief towns, Mullingar and Athlone.

West'minster: city; capital of Carroll co., Md.; on the Western Md. Railroad; 34 miles N. W. of Baltimore (for location, see map of Maryland, ref. 1–E). It has 7 churches, several public and private schools, 3 national banks with combined capital of $275,000, a savings-bank with capital

of $10,000, a private bank, a monthly and 2 weekly periodicals, gas and electric light plants, steam flour-mills, phosphate-works, and machine-shops. The city is the seat of Western Maryland College (Methodist Protestant), which in 1894 had 16 instructors, 254 students, and 3,000 volumes in its library. Pop. (1880) 2,507; (1890) 2,903; (1900) 3,199.

EDITOR OF "AMERICAN SENTINEL."

Westminster, HUGH LUPUS GROSVENOR, First Duke and Third Marquis of: son of Richard, the second marquis, and his wife, Elizabeth Mary, daughter of the first Duke of Sutherland: b. in London, England, Oct. 13, 1825; was member of Parliament for Chester 1847–69; succeeded to the marquisate on the death of his father Oct. 31, 1869, and was created a duke 1874. He married his cousin, Lady Constance Leveson-Gower, daughter of the second Duke of Sutherland, in 1852, and in 1882 Katherine, daughter of Baron Chesham. He was reputed the wealthiest nobleman in Europe. D. Dec. 22, 1899.

Westminster Abbey: a conventual church in Westminster, a district included in the modern town of London. The monastery and church were dedicated to St. Peter, but as the sovereigns of England have been crowned in the abbey church for the last 1,000 years, and as it is the place where persons of celebrity have been buried for nearly as long, the church building itself has a special repute although the monastery has disappeared.

Architecture.—Long before any portion of the present building was in existence there stood upon the same spot a Saxon church. That church, built within what was called Thorney Isle, from its being covered with brushwood, was connected long before the Conquest with a monastic body of the Benedictine order, who named the place of their abode the Western Monastery, or Westminster, to distinguish it, some say, from St. Paul's in London, which was called East Minster. The first church here of which, architecturally considered, we possess any knowledge was that built by Edward the Confessor, and consecrated Dec. 28, Holy Innocents' Day, 1065. Though built by a Saxon king, it was in the Norman style, cruciform in shape, and exceeding in magnificence any sacred building at that time in England; and there still remains, under what is called the pyx-house, a noble crypt pertaining to the Norman structure. Henry III. rebuilt the greater part of the abbey church in the style denominated Early English; and it is his work that is seen in the transepts and the choir. He had previously raised a Lady chapel at the east end; and then, when he erected the choir and transepts, he transferred the high altar to the place it now occupies, and reared behind—between it and the Lady chapel—a lofty shrine, to which he removed the body of Edward the Confessor. That shrine, somewhat mutilated, still remains. The nave was built under the Edwards, and the west front and its grand window, as well as the completion of the nave and aisles, belong to the latter part of the fifteenth century. Henry VII. pulled down the Lady chapel, and built that which now bears his name, a charming specimen of the florid architecture of the period—i. e. Late Perpendicular—with richly mullioned windows and roof in fan-vaulting. The gates are beautiful specimens of metal-work. Sir Christopher Wren was the architect of the upper part of the western towers, which are by no means in keeping with the rest of the church. The extreme length of the whole is 531 feet, and the width across the transepts 203. The width of the nave and aisles is 79 feet; of the choir, 38; and of Henry VII.'s chapel, 70. The height of the roof is 102 feet, an unusual elevation in England. The present cloisters were built in the thirteenth and fourteenth centuries. The chapter-house is an architectural gem of about 1250, restored after long neglect.

History.—The historical associations of the abbey can best be studied in Dean Stanley's *Memorials*. The coronation-stone brought from Scotland by Edward I. may be seen under the coronation-chair used by Richard II., which ever since, there is reason to believe, has been occupied by the English sovereigns during the solemnity of their inauguration. The funerals of kings and queens have also taken place in the minster. The remains of Oliver Cromwell, who never wore the crown, were for a time in a vault under Henry VII.'s chapel, having been deposited there with a pomp which royalty could not exceed. In the chapter-house the Commons met when that body became an assembly distinct from the Lords, and repeated their sittings there as late as the end of the reign of Henry VIII. The history of the abbey is interwoven with that of the English Reformation. One of the Protestant martyrs, Thomas Bilney, was arraigned before Cardinal Wolsey in the Westminster chapter-house. The abbey fell at the time of the dissolution of the monasteries, and the abbot was succeeded by a dean. In Queen Mary's time it was restored, but after Elizabeth's accession the present institution of dean and chapter were established. Convocations were transferred to Westminster in the time of Henry VIII. The convocation that acknowledged the royal supremacy was held here. In the time of Elizabeth the bishops met in Henry VII.'s chapel. In the Jerusalem chamber the bishops debated the final alterations made in the Book of Common Prayer in 1662; and afterward some of the most exciting scenes connected with the history of Convocation in the reigns of William III. and Anne occurred in the chamber itself, or in that part of the abbey where the lower house had been convened. The fortunes of the abbey have followed those of the nation. The Westminster Assembly was held in the Jerusalem chamber, and when, during the civil wars and Commonwealth, Episcopalian worship was interrupted, Presbyterians and Independents occupied the pulpit; while with the restoration of Charles II. worship resumed its former character. While Dr. Stanley was dean (1863–81), proceedings occurred in the abbey of national interest. Sermons on Sunday evenings have been preached here to vast audiences; and for a number of years—on the evening of St. Andrew's Day, Nov. 30, set apart for intercession on behalf of missions—a layman professor, Max Müller, a Presbyterian clergyman, Dr. John Caird, and a Congregational missionary, Dr. Robert Moffat, delivered lectures from the lectern in the center of the nave; also, celebrations by Roman Catholics have been held within its walls since 1890.

Monuments.—The tombs and monuments in the abbey are exceedingly numerous, and the life-stories of those who are buried under the pavement or commemorated on the walls would almost form a national biography. Some of the principal are grouped together according to the grounds on which history builds their fame. Sovereigns and members of royal families have graves and tombs in the chapels of Edward the Confessor and Henry VII. Edward himself lies under the shrine which bears his name, and which is curious as a work of art belonging to the age of Henry III., who is buried on the north side. And next to him lies Edward I. On the south side lie Edward III. and Richard II., and to the E. Henry V. in the beautiful chantry named after him. In the center of Henry VII.'s chapel the founder and his wife repose side by side; at the west end is the sepulcher of Edward VI. In the north aisle are Queen Elizabeth and her sister Mary; in the opposite aisle is Mary Queen of Scots. Close to the tomb of Henry VII. we meet with the grave of King James; Charles II. is buried at the east end of the north aisle. His grave is unmarked; so is that of William III. Queen Anne was laid next her sister Mary in the southern aisle. George II. was the last of the kings interred in the abbey. The interment was in Henry's chapel. The north transept is distinguished as the resting-place of eminent statesmen—Pitt, Fox, Wilberforce, Canning, Peel, Palmerston. In the south transept is "Poets Corner." Here lie Chaucer, Spenser, Beaumont, Ben Jonson, Cowley, Dryden, Addison, Tennyson; also hard by are monuments to Shakspeare, Milton, Isaac Watts, Goldsmith, and Johnson. Numbers of generals, admirals, courtiers, divines, men of letters, etc., are covered by the marble pavement or have memorials by the pillars or on the walls. Two slabs on the central floor of the nave mark the last home of George Stephenson and David Livingstone. See *Memorials of Westminster*, by Dean Stanley (London, 1868; supplement 1869).

Revised by RUSSELL STURGIS.

Westminster Assembly: an assembly which convened in Westminster Abbey, London, in 1643, and which has exercised a great and lasting influence on the history and development of Presbyterianism. After some unsuccessful attempts to obtain the sanction of the king, it was summoned by ordinance of the two houses of the English Parliament. It was intended that it should include among its members adherents of all the chief parties among English-speaking Protestants with the exception of that of Archbishop Laud, whose innovations and despotic tendencies had been one main cause of the troubles in Church and state. Almost all the clerical members were in episcopal orders, three or four were bishops, five afterward rose to be so, and several were known to be favorable to the continuance of episcopacy and

to side with the king rather than with the Parliament. Places were found for some of the ministers of the French churches in England, for one or two representatives of the Church of Ireland, and for some who had been pastors of the English churches in Holland; while invitations to send commissioners were addressed to the Church of Scotland, and, it is said, also to the churches of New England. The Assembly, as originally constituted by the ordinance, consisted of 121 divines and of 30 lay assessors, of whom 10 were peers and 20 commoners. Additions were made from time to time, chiefly to supply the places of those who had failed to attend or had been removed by death. The purposes for which, according to the ordinance, the Assembly was convoked were to vindicate the doctrine of the Church of England from all calumnies and false aspersions, and to recommend such further reformation of her discipline, liturgy, and government as might "be agreeable to God's holy word, and most apt to procure and preserve the peace of the Church at home, and nearer agreement with the Church of Scotland and other Reformed churches abroad." But when the Parliament, feeling their need of Scottish aid, acceded to the Solemn League and Covenant and urged the Scotch to send deputies to the Assembly, its objects were extended; and to promote the covenanted uniformity it was empowered to prepare a new confession of faith and catechism, as well as directories for public worship and church government which might be adopted by the churches of the three kingdoms. It retained to the last, however, that advisory character which has made some question whether it was properly an ecclesiastical synod at all, though in this respect it only resembled an ordinary English convocation, and in those respects in which it differed from that body it may claim the benefit of what is said in chap. xxxi., sec. ii., of its Confession.

It was on Saturday, July 1, 1643, that the divines, with the two Houses and a great congregation, met in Westminster Abbey, and after sermon by Rev. William Twisse, who had been named as prolocutor, the Assembly was constituted in the chapel of Henry VII., in which only three years before Laud's unfortunate convocation had been held. On the names being read over, it was found that "threescore and nine" had obeyed the summons of the Parliament. Bishop Brownrigg sent an excuse for his absence; Bishop Westfield and a few other royalists and conformists were actually present, and by the retention of their canonical habits seemed, as Fuller says, "the only Nonconformists." The most of the divines came not in canonicals, "but in black coat or cloak and bands, in imitation of the foreign Protestants," and probably a more correct idea of the appearance of the Assembly may be formed from the plate of the French synod prefixed to the first volume of Quick's *Synodicon* than from the plate of the Assembly so common in England. The meetings continued to be held in the chapel of Henry VII. till after the arrival of the Scottish commissioners, and were chiefly occupied with the revision of the first fifteen of the English Articles. Soon after, the Covenant was subscribed by the Assembly and the House of Commons, and the last remaining royalist, Dr. Featley, of Lambeth, was expelled for opposing it, and for revealing the proceedings to Ussher, then in the king's quarters at Oxford. The Assembly was now authorized by the houses to treat of the questions of Church government and worship; and about the same time, that it might have the benefit of a fire, it removed from Henry VII.'s chapel to the Jerusalem chamber, which since that time has generally been the meeting-place of the upper house of Convocation.

The debates on the subject of Church government were keen and protracted, and unexpected obstacles arose which for a time retarded a settlement. Twisse, Gataker, Palmer, Temple, and several other learned divines who were cordially on the side of the Parliament were inclined toward what they termed primitive episcopacy, under which the presbyters and their president governed the churches in common. Ultimately they agreed to acquiesce in the Presbyterian system as affording the only chance of constituting a comprehensive national Church, with such reasonable powers of self-government as would prevent the recurrence of the oppressive despotism under which they had so long groaned. The Scotch commissioners and their more thoroughgoing associates, the Puritans of the school of Cartwright, had for the sake of union occasionally to forego the claim of a *jus divinum* for the details of their polity, and to rest contented with the phrase "lawful and agreeable to the word of God," instead of "expressly instituted or commanded." The Independents, though fewer in number than either of the other parties, yet, backed up by their political friends outside, proved more unyielding, and in the end resolved rather to seek for toleration outside the national Church than for comprehension within it if it were not to be constituted more in accordance with their system than the majority of the Assembly were willing to allow. It was therefore agreed to lay aside the discussion of these topics for a time, and proceed to take up subjects on which there was likely to be a greater amount of harmony.

The subjects on which least disagreement was expected were those relating to the form of public worship and the statement of doctrines. Early in 1644 the Assembly remitted each of these to a small committee to prepare materials for the decision of them, and to bring these first before the large committees, and then before the Assembly. In this way the *Directory for Public Worship* was prepared in 1644, considerable progress was made with a practical *Directory for Church Government* in 1644–45, though the printing of it was delayed till 1647, and in 1645–46 the *Confession of Faith* was elaborated, and finally put into the shape in which it is still printed in Scotland. In the two following years the Assembly elaborated the *Catechisms*, and prepared the Scripture proofs for them as well as for the *Confession of Faith*. It spent part of the time also in attempting to complete its answers to the famous Erastian *Queries* of the House of Commons, and gave its sanction to certain papers in answer to the Independents, formally drawn up by its grand committee. These last appeared ultimately in the volume entitled *The Grand Debate concerning Presbytery and Independency*. The former were never completed and published, but it is said that the substance of them is given in the preface to the *Jus Regiminis Ecclesiastici Divinum*, prepared by the London ministers. After 1648 the Assembly occupied itself almost exclusively with the examination of those appointed to ecclesiastical charges or desiring license as expectants or probationers, and it was only occasionally that the full quorum of forty could be brought together. The 1,163d session was held Feb. 22, 1649, when all its important labors had been fully concluded. The subsequent sessions are not numbered, but the last of which an entry is made in the minutes took place on Mar. 25, 1652. These minutes, which are pronounced by competent judges to be almost entirely in the handwriting of Adoniram Byfield, are still preserved. The whole of them were transcribed at the expense of the Church of Scotland, and the more important portion of them has been published in Edinburgh. The Assembly was not formally dissolved, but, as Fuller says, "it dwindled by degrees," and "vanished with the Parliament" which gave it birth. See WESTMINSTER STANDARDS.

Most divergent estimates have been formed of the merits of this Assembly from the time it met down to our own day. Clarendon has spoken of its members and their work with great contempt, and others have "damned them with faint praise"; but Baxter, perhaps as competent as any among their contemporaries to give an impartial verdict, did not hesitate to affirm that "the divines there congregated were men of eminent learning and godliness, and ministerial abilities and fidelity; and being not worthy to be one of them myself, I may the more freely speak that truth which I know even in the face of malice and envy, that, as far as I am able to judge by the information of all history, . . . the Christian world since the days of the apostles had never a synod of more excellent divines." "This," as Dr. Stoughton, one of the most competent judges in our own day, observes, "is high praise, but it comes nearer the truth than the condemnatory verdicts pronounced by some others. The Westminster divines had learning, scriptural, patristic, scholastical, and modern, enough and to spare, all solid, substantial, and ready for use." Hence their work has stood the test of time, and is still valued and honored. Almost all of them were graduates of the Universities of Oxford and Cambridge. Several of them had been honored to suffer in defense of the truths they taught, and many of them had the courage afterward to brave suffering, insult, and poverty rather than renounce their creed or abandon their views of church polity and discipline.

LITERATURE.—*Minutes of the Sessions of the Westminster Assembly of Divines*, edited by Alexander F. Mitchell and John Struthers (Edinburgh, 1874); Lightfoot's *Journal of the Proceedings of the Assembly of Divines*; vol. xiii. of *Works* (London, 1824); Gillespie's *Notes of the Proceedings of the Assembly of Divines*, in vol. ii. of *Works* (Edinburgh,

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Westminster Confession of Faith and Catechisms: See WESTMINSTER STANDARDS.

Westminster Hall: a large hall, all that remains of the ancient palace of Westminster. It is a very large room to have a roof unsupported by columns, being 68 feet wide in the clear, and covered by an open timber roof, the finest in existence, and which has remained perfect except for minor repairs since the close of the fourteenth century. In its present form it was built during the reign of Richard II. When the new Westminster palace was designed after the fire of 1834, it was proposed to make Westminster Hall a part of it, but Sir Charles Barry, who was successful in the competition among the architects, treated it as a vestibule or entrance hal , which it remains. The public pass through the whole length of the hall from north to south, ascend the stairs at the southern end to St. Stephen's porch, then turn to the east and enter the new building at St. Stephen's Hall. Members of Parliament, on the other hand, may at their choice pass through a door half way up the hall in the middle of the east side or, skirting the hall on the east, may pass along a cloister on Star Chamber Court. The peers do not enter here at all, but by a separate entrance on old Palace Yard. Westminster Hall has been the scene of many stirring events. Here Sir Thomas More and the Protector Somerset were tried and condemned. Not to mention other trials, King Charles I. here appeared before the High Court of Justice, while the banners of Naseby hung over his head. Here the seven bishops just before the Revolution were acquitted, Dr. Sacheverell and the rebel lords of 1745 were convicted, and Warren Hastings passed through that ordeal which has been rendered so famous by the eloquence of Burke and Sheridan and by the most brilliant assemblage, perhaps, ever seen in a court of justice. It must be also mentioned that here Oliver Cromwell was inaugurated as Lord Protector of England. At the coronation of George IV., Westminster Hall witnessed a coronation banquet, and at the same time the challenge of the king's champion on horseback in complete armor.

Westminster Hall was long the center of the English law courts; abutting on it were the court of chancery, the court of king's or queen's bench, the court of common pleas, and the court of exchequer. Revised by RUSSELL STURGIS.

Westminster Palace: the great building fronting on the Thames in the southwestern part of London in which are the meeting-rooms of the Houses of Parliament of Great Britain and Ireland together with the libraries, committee-rooms, etc., necessary for parliamentary business. It takes its name from the Royal Palace which formerly stood on this site, but which was nearly abandoned at the time of Henry VIII. The Houses of Lords and Commons assembled within the old walls. The latter began to meet in St. Stephen's chapel in the reign of Edward VI. St. Edward's, or the Painted Chamber, was used by the Lords and Commons when they came together for conferences. In the year 1834 a terrible fire destroyed the whole pile, so long interwoven with the royal and national history of England.

The new palace of Westminster occupies the site of the old one. It has four fronts. The east, or river front, presents a façade of 900 feet, divided into compartments, paneled with tracery, and decorated with statuary and coats-of-arms. The other fronts are in the same style, and exhibit the same profusion of ornament. Three principal towers adorn the edifice—the Royal Victoria tower, the central tower, and the clock tower. The first is 340, the second 300, and the third 320 feet in height. The present chambers occupied by the two houses are richly adorned with historical paintings, stained glass, carving, and metal work. The royal entrance, the royal gallery, the central hall, the passages, and the libraries are all elaborately decorated.

Revised by RUSSELL STURGIS.

Westminster School: one of the seven great public schools of England. As it now exists, it was founded by Queen Elizabeth in 1560, but there was an abbey school long before. The school-room was a dormitory of the abbey, and the college hall was the abbot's refectory, built by Abbot Litlington under Edward III. The dormitory was built by the Earl of Burlington in 1722. According to an old custom, the boys at Christmas perform one of Terence's plays, with a prologue and epilogue written for the occasion and suited to the times. Westminster School can boast of distinguished men among its masters and pupils. Of the latter were Ben Jonson, George Herbert, Giles Fletcher, Cowley, Dryden, Prior, Churchhill, Cowper, Southey; the statesmen Sir Harry Vane, Halifax, Warren Hastings, Marquis of Lansdowne, Burdett, Graham, and Earl Russell; the warriors Marquis of Anglesey, Lord Combermere, Lord Raglan; and, among other celebrated men, Locke, South, Christopher Wren, Atterbury, Gibbon.

Westminster Standards: a title under which are sometimes comprehended all the church books drawn up by the Westminster Assembly, at others only those relating to doctrine, and accordingly, though these were drawn up last, they will be treated of first in this article.

(1) *Confession of Faith.*—A committee was appointed by the Assembly "to prepare matter for a joint confession of faith" as early as Aug. 20, 1644. It consisted of Drs. Gouge, Temple, and Hoyle, Messrs. Gataker, Arrowsmith, Burroughs, Burgess, Vines, and Goodwin, together with the Scotch commissioners. A fortnight later Dr. Smith and Messrs. Palmer, Newcomen, Herle, Reynolds, Wilson, Tuckney, Young, Ley, and Sedgewick were added to the committee. In all probability the material afterward embodied in the Confession was, in part at least, prepared by this committee. But the digesting of the matter into a formal "draught" was, on May 12, 1645, intrusted to a small committee consisting, apparently, of Drs. Temple and Hoyle, Messrs. Gataker, Harris, Burgess, Reynolds, Herle, and the Scotch commissioners. On July 7, 1645, Dr. Temple "made report of that part of the Confession of Faith touching the Scriptures," and it was read and debated. The following day Messrs. Reynolds, Herle, and Newcomen (to whom were afterward added Messrs. Tuckney and Whitaker) were appointed a committee to "take care of the wording of the Confession," as its articles should be voted in the several sessions. On July 16 report was made from the committee of the heads of the Confession, and these were distributed among the three large committees of the Assembly, to be by them elaborated and prepared for more formal discussion. All were repeatedly read and debated, paragraph by paragraph, and sometimes word by word, in the Assembly. On Sept. 25, 1646, the first nineteen chapters, and on Dec. 4 of that year the whole Confession, were finally passed, and then presented to the Houses of Lords and Commons. They gave orders that 600 copies should be printed for the use of members of Parliament and of the Assembly, and that Scripture proofs should be added to the Confession, which was accordingly done. In 1647 the Confession was approved by the Church of Scotland in the form in which it had passed the Assembly, and it was subsequently ratified by the Scottish Parliament. In 1648, under the title of "Articles of Christian Religion," and with certain changes, most of which were afterward adopted by the Savoy Conference, it was passed by the English Parliament.

Sources and Character of the Confession.—It has been maintained that the Assembly's confession was derived mainly from foreign sources, and even that it "bears unmistakably the stamp of the Dutch theology in the sharp distinctions, logical forms, and juridical terms into which the reformed doctrine had gradually moulded itself under the red heat of the Arminian and Socinian controversies." But there is conclusive evidence that in its general plan, and in the tenor and very words of its more important articles, it was derived not from foreign but from native sources. It may confidently be traced up to those confessedly Calvinistic or Augustinian articles which are supposed to have been prepared by Ussher, and in 1615 were

adopted by the convocation of the Irish Church. This was before the Synod of Dort had met, or the bitterness and heat which the debate of the Arminian controversies occasioned had extended to Britain. In these articles we have the main sources of the Assembly's Confession of Faith, and almost its exact prototype in its statement of all the more important and essential doctrines of Christianity. In the order and titles of many of its chapters, as well as in the language of whole sections or subdivisions of chapters, and in many single phrases, and *voces signatæ* occurring throughout their Confession, the Westminster divines followed very closely in the footsteps of Ussher and his Irish brethren. The minutes clearly show that the attempt to determine questions left open by the Synod of Dort was seldom made, and that when it was made it was strenuously resisted by the pupils and successors of the English divines, who claimed to have moderated the conclusions of that synod. With respect to the doctrine of the covenants, and the juridical phraseology which some assert were imported into England through Cocceius (whose chief work on the subject, however, was not published till after the Confession had been framed), there is nothing taught by the Westminster divines which had not in substance been found by Rollock, in Scotland, and Cartwright, in England, half a century before, while there is an advance on what is taught in the Dutch *Synopsis Purioris Theologiæ* of 1642. In regard to the important chapters on "The Holy Scripture," on "God's Eternal Decree," on "Christ the Mediator," and on "The Lord's Supper," which so largely determine the character of the Confession, the resemblance to the Irish articles, both in language and arrangement, is so close that hardly a doubt can be entertained either of the sources from which it was derived, or of the design of its framers in following in the footsteps of Ussher. They meant their Confession to be in harmony with the *consensus* of the Reformed churches; they desired it to be a bond of union, not a cause of strife, among those who adhere to the sum and substance of the doctrine of the Reformed churches.

The Confession, under the title of *The Humble Advice of the Assembly of Divines now by authority of Parliament sitting at Westminster concerning a Confession of Faith*, etc., was printed at London in Dec., 1646, without proofs, and in May, 1647, with proofs, for the use of the Houses of Parliament and the Assembly. A copy of this last edition was taken to Scotland by the commissioners, and from it 300 copies were printed for the use of the General Assembly there. After being approved by that body, it was published in Scotland with the title *The Confession of Faith agreed upon by the Assembly of Divines*, etc., and, to the indignation of the House of Commons (which had not yet approved of it), this was reprinted by a London bookseller in 1648. In the same year it was, with the omission of part of chapters xx. and xxiv., and the whole of chapters xxx. and xxxi., and with some minute verbal alterations, approved by the two houses, and published under the title *Articles of Christian Religion, approved and passed by both Houses of Parliament after advice had with the Assembly of Divines*, etc. But in this instance the Assembly proved too strong for the Parliament, even though the Savoy Conference sided with the latter; and the Confession continues to be printed in Britain in the form in which it was drawn up by the Assembly and approved by the Church of Scotland. Under the title of *Truth's Victory over Error*, Dickson, Professor of Divinity in Edinburgh, published a brief catechetical exposition of the Confession in 1649.

(2) *Catechisms.*—The catechism which Baillie reports to have been drawn up and nearly agreed to in the end of 1644 was probably that which had been almost completed, and to a considerable extent had been passed, by the Assembly while still occupied with its Confession of Faith. But on Jan. 14, 1646–47, upon a motion made by Mr. Vines, it was ordered, "That the committee for the Catechism do prepare a draught of two catechisms, one more large, and another more brief, in which they are to have an eye to the Confession of Faith and to the matter of the Catechism already begun." The Larger Catechism was first proceeded with. This appears distinctly from the minutes of the Assembly, though the opposite view is still sometimes maintained. It may be admitted that the Shorter one at times embodies more of the materials of the original Catechism, and seems to be less directly drawn from the Confession of Faith, but it was not cast into its present shape till after the Larger one was completed, and all the Scotch commissioners except Rutherford had left the Assembly. Tradition attributes to Gillespie the answer given in it to the question, What is God? but so far as can be ascertained from the minutes the answer to that question, even in the Larger Catechism, was not moulded into its present shape till after Gillespie returned to Scotland, but remained somewhat of the same form as it bears in the original draught and in the catechisms of Ussher and Cartwright. Some suppose that the Smaller Catechism of Cartwright was a good deal followed by the Assembly's committee; but no accurate comparison has yet been instituted between the Assembly's catechisms and those which had previously appeared in England, especially during the years immediately preceding. Tuckney had the chief share in digesting the Larger Catechism into its present form, and he was also convener of the committee which prepared the Shorter, though some think that in its more concise and severely logical answers they discern traces of the handiwork of Wallis, the mathematician. Both catechisms, as has been well observed by the younger M'Crie, "are inimitable as theological summaries; though when it is considered that to comprehend them would imply an acquaintance with the whole circle of dogmatic and controversial divinity, it may be doubted whether either of them is adapted to the capacity of childhood. But if too little regard has been paid in former days to the *intelligent* training of our youth in such catechisms, . . . experience has shown that few who have been carefully instructed in our Shorter Catechism have failed to discover the advantage of becoming acquainted in early life, even as a task, with that admirable 'form of sound words.'"

Ridgley's *Body of Divinity* is virtually an exposition of the Larger Catechism. Alleine, Vincent, and Flavel in England, and Fisher, Willison, and several others in Scotland, have published expositions of the Shorter Catechism.

(3) *Directory of Public Worship.*—This occupied the attention of the Assembly during the greater part of the year 1644, and received the sanction of the English houses of Parliament on Jan. 3, 1644–45, though one or two alterations were made in March following to meet the views of the Scotch. It was approved by the Scotch General Assembly and Parliament in Feb., 1645, with one reservation. The first English edition bears the date of 1644, but was really published in what, according to our reckoning, would be Mar., 1645. The first Scotch edition bears the date of 1645, and has been recently reprinted by the Messrs. Blackwood with an historical introduction and notes by Dr. Leishman, of Linton. From the preface, as well as from the testimony of those engaged in framing it, we may clearly infer that the Directory was not intended to form a new liturgy, the very words of which might be turned by the minister into a fixed and unvarying form of prayer. The meaning of its framers, as they themselves tell us, only was that there might be "a consent of all the churches in those things that contain the substance of the service and worship of God," and that the ministers might, "if need be, have *some help and furniture*, and yet so as they become not hereby slothful and negligent in stirring up the gifts of Christ in them, but that each, by taking heed to himself and the flock of God committed to him, and by wise observing the ways of Divine Providence, may be careful to furnish his *heart and tongue* with *further or other* material of prayer and exhortation as shall be needful on all occasions." Its minuter directions have never been regarded as rigidly binding, but it were much to be wished that more heed were given to these wise and weighty counsels.

(4) *Church Government and Discipline.*—Two treatises on these subjects proceeded from the Westminster Assembly. The preparation of the former, to which it set itself shortly after subscribing the Covenant, was attended with many difficulties. It was entitled by its framers *Propositions concerning Church Government*, but it is now generally known as the *Form of Church Government*, and under this title it is still printed, along with Scotch editions of the Confession of Faith. The greater part of it had been drawn up before Feb., 1645, and the same month was presented apparently in manuscript to the Scotch Assembly, which approved of it as far as then completed, with certain reservations, and agreed to carry it out in practice as soon as it should be ratified without substantial alteration by the English Parliament. It never was so ratified. The best friends of Presbytery in England became satisfied that they must be contented to get the assent of their countrymen to their system as one that was lawful and agreeable to the word of God, and that could be justified by considerations of reason and expediency in many details for which divine warrant could not be claimed.

Urged by these and the friends of comprehension generally, the Assembly set itself in 1645 to prepare its *Directory for Church Government* and discipline. Henderson took special interest in the preparation of this, and furnished, in part at least, its materials, and all the Scotch commissioners assented to it. To a large extent it was adopted by the English Parliament in 1648 in their *Ordinance as to the Form of Church Government*. It was printed in Scotland in 1647, and reprinted, along with Henderson's *Form and Order of the Government of the Church of Scotland*, in 1690, and use was made of it in drawing up the *Form of Process* in the Church of Scotland in 1707, but it was never formally approved of, nor is it so well known as it deserves to be.

ALEX. F. MITCHELL.

West'morland: northern county of England; area, 790 sq. miles. The surface is mountainous, the mountains, of which some rise over 3,000 feet, alternating with moorland, heath, and lakes. Useful minerals abound, and coal, lead, and copper mines are worked. Agriculture is in a backward state and of small consequence; the raising of sheep and geese is one of the principal occupations. Pop. (1891) 66,215; (1901) 64,411.

West Newbury: town (incorporated in 1820); Essex co., Mass: on the Merrimac river, 8 miles S. E. of Newburyport, 32 miles N. of Boston (for location, see map of Massachusetts, ref. 1–I). It contains a high school, 11 district schools, public library, and 2 churches, and is principally engaged in agriculture, and the manufacture of shoes and combs. In 1894 it had an assessed valuation of over $1,000,000. Pop. (1880) 1,989; (1890) 1,796; (1900) 1,558.

West Newton: borough; Westmoreland co., Pa.; on the Youghiogheny river, and the Balt. and O. and the Pitts. and Lake Erie railways; 33 miles S. E. of Pittsburg (for location, see map of Pennsylvania, ref. 5–B). It is in an agricultural region, and has a private bank, a weekly newspaper, and large coal, coke, limestone, and lumber interests. Pop. (1880) 1,475; (1890) 2,285; (1900) 2,467.

Weston: village; York County, Ontario, Canada; on the Humber river, and the Canadian Pac. and the Gr. Trunk railways; 8½ miles N. W. of Toronto (for location, see map of Ontario, ref. 4–D). It is in an agricultural region, and has flour, grist, and woolen mills, foundry, carriage-factory, windmill, and pump-works, and a weekly newspaper. Pop. (1881) 1,000; (1891) 1,191.

Weston: town (incorporated in 1712); Middlesex co., Mass.; on the Charles river, and the Boston and Maine and the Fitchburg railways; 13 miles W. of Boston (for location, see map of Massachusetts, ref. 2–H). It contains the villages of Weston and Kendall Green; has a high school, 6 district schools, public library, and 4 churches; and is principally engaged in agriculture. In 1894 it had an assessed valuation of over $3,000,000. Pop. (1880) 1,448; (1890) 1,664; (1900) 1,834.

Weston: town (founded about 1832); Platte co., Mo.; on the Missouri river, and the Kan. City, St. Jo., and Council Bluffs Railroad; 9 miles N. of Leavenworth, Kan., and 32 miles N. W. of Kansas City (see map of Missouri, ref. 3–D). It has 9 churches, 2 public-school buildings, 2 private banks, 3 club-houses, a weekly newspaper, several saw-mills, roller flour-mill, distillery, brewery, carriage and wagon shops, and pork-packing establishments. Pop. (1880) 1,329; (1890) 1,134; (1900) 1,019.

EDITOR OF "CHRONICLE."

Weston: town; capital of Lewis co., W. Va.; on the W. Fork of the Monongahela river, and the W. Va. and Pitts. Railroad; 70 miles S. E. of Parkersburg, 80 miles S. by E. of Wheeling (for location, see map of West Virginia, ref. 7–H). It is in an agricultural and stock-raising region; contains the First State Hospital for the Insane, a national bank with capital of $100,000, a State bank with capital of $50,000, a saw-mill, a planing-mill, and a flour-mill; and has four weekly newspapers. Pop. (1900) 2,560.

Weston, EDWARD: See the Appendix.

Weston, THOMAS: adventurer; b. in England about 1575; became a merchant in London; advanced £500 to the agents of the Leyden Pilgrims 1620 when fitting out the Mayflower expedition, but soon abandoned his connection with them as unprofitable, and personally began in 1622 another settlement at Wessagussett (now Weymouth) under a grant given by the king to Sir Ferdinando Gorges. His settlers were improvident, and soon had to be supported by the Pilgrims at Plymouth, and most of them, like Weston himself, returned to England where he died after 1624.

Westphal, vest'faăl, KARL FRIEDRICH OTTO, M. D.: alienist: b. in Berlin, Germany, Mar. 23, 1833; studied at the Universities of Berlin, Heidelberg, and Zurich; in 1857 was appointed assistant in the Charity Hospital, Berlin, at first having charge of the smallpox wards, but in 1858 being transferred to the wards for mental diseases; in 1861 was a privat docent of psychiatry at the University of Berlin, becoming in 1869 professor extraordinary, and in 1874 Professor of Diseases of the Mind and Nervous System. Through his efforts the system of severity and restraint practiced in the insane wards was abolished. In 1868 he became associate editor and subsequently editor of the *Archiv für Psychiatrie und Nervenkrankheiten*. D. of paresis, at Constance, Jan. 27, 1890.

S. T. ARMSTRONG.

Westphal, RUDOLF: classical scholar; b. at Oberkirchen, Schaumburg, Germany, July 3, 1826; studied mathematics, chemistry, classical and Oriental languages at Marburg; 1852 privat docent in Tübingen; 1858–62 professor extraordinary in Breslau; retired to private life, but in 1873 accepted a call to the University of Moscow, Russia. D. at Stadthagen, Germany, July 10, 1892. Westphal's enduring fame rests upon his contributions to Greek music and versification. His chief work was first published in 1865. The third edition, entirely rewritten, is entitled *Theorie der musischen Künste bei den Hellenen*: vol. i., *Rhythmik* (1885); vol. ii., *Griechische Harmonik und Melopöie* (1886); vol. iii., part i., with the collaboration of H. Gleditsch, *Allgemeine Theorie der griechischen Metrik* (1887); part ii., by A. Rossbach, *Griechische Metrik mit besonderer Rücksicht der Strophengattungen* (1888). His editions of Hephæstion: Pseudo-Plutarch's *De musica*; his treatise on Aristoxenus of Tarentum; *Metrik und Rhythmik des klassischen Hellenenthums* (Leipzig, 1883); *Die Musik des griechischen Alterthums nach den alten Quellen neu bearbeitet* (Leipzig, 1883) must also be mentioned. The versatility of Westphal is shown by the following titles of works, all of which are indispensable to the student of the respective subjects: *Methodische Grammatik der griechischen Sprache* (2 vols., Jena, 1872); *Prolegomena zu Aeschylus's Tragödien* (1869); *Theorie der neuhochdeutschen Metrik* (2 vols.); *Vergleichende Grammatik der indogermanischen Sprachen* (1873, of which the first volume only, dealing with the verb, appeared); a translation of *Catullus*, with introduction and notes (Breslau, 2d ed. 1869). See Bursian's *Geschichte der klassischen Philologie in Deutschland*.

ALFRED GUDEMAN.

Westpha'lia: province of Prussia; bounded by the Rhine province, Holland, Hanover, Schaumburg-Lippe, and Lippe-Detmold, Brunswick, Hesse-Nassau, and Waldeck. It has existed in its present form since the Vienna Congress of 1815. Area, 7,892 sq. miles; pop. (1895) 2,701,420 Germans, with a dialect of their own tending toward the Low German or *Flattdeutsch*. The surface of Westphalia is mountainous or hilly, except in the circuit of Münster, which is a low plain. The Ems, the Vechte, and the Lippe are the natural waterways, so far as they are navigable. Manufacturing and agriculture are the chief industries. The soil is barren in the north and northeast, but very fertile in the southern valleys. Westphalia's chief wealth, however, is in its mineral treasures. Next to the Rhine province it is the richest province in iron; in zinc it is next to Silesia; in copper next to Saxony; and richest of all in coal, lead, sulphur, antimony, also in marble, stones, slate, and salt deposits. There are thirty-four mineral springs, some of them quite famous. Besides iron-working and stone-cutting, all kinds of textile industries have been carried on since the fourteenth century around the great center of Bielefeld. Grain and flax, hemp and hops are raised in large quantities; the foremost commercial cities are Bielefeld, Iserlohn, Dortmund, and Minden, the port on the Weser. There is a great railway system with Hamm as its central station. The province is divided into the three circuits: Münster, Minden, and Arnsberg. The seat of the highest provincial administration is in Münster, where there is a Roman Catholic theological and philosophical academy (university until 1818).

HERMANN SCHOENFELD.

Westphalia, Treaty of: See TREATIES.

West Pittston: See PITTSTON.

West Plains: city; capital of Howell co., Mo.; on the Kan. City, Ft. Scott and Memphis Railroad; 118 miles S. E. of Springfield, 130 miles S. of Jefferson City (for location, see map of Missouri, ref. 8–H). It is in a fruit-growing region, particularly apples and grapes: has large farming, stock-

raising, and lumbering interests, 2 State banks with combined capital of $55,000, and 2 daily and 3 weekly newspapers. Pop. (1880) 351; (1890) 2,091; (1900) 2,902.

EDITOR OF "GAZETTE."

West Point: city (laid out in 1828); Troup co., Ga.; on the Chattahoochee river, and the Atlanta and West P. and the West. of Ala. railways; 16 miles S. W. of La Grange, 87 miles S. W. of Atlanta (for location, see map of Georgia, ref. 4–F). It contains 4 churches, large public school, an opera-house, 2 private banks, 3 cotton-factories with combined annual consumption of 24,000 bales, ginnery and cotton-seed-oil mill with annual output of 3,000 tons, and an iron-foundry with annual output valued at $50,000. Pop. (1880) 1,972; (1890) 1,254; (1900) 1,797.

W. J. MCKEME, SUPERINTENDENT OF PUBLIC SCHOOL.

West Point: town (founded in 1857); capital of Clay co., Miss.; on the Ill. Cent., the Mobile and Ohio, and the South. railways; 97 miles N. of Meridian, 150 miles S. E. of Memphis, Tenn. (for location, see map of Mississippi, ref. 5–H). It is in an agricultural and cotton-growing region; contains 6 churches, the Southern Female College, the West Point Military Academy, public graded schools, a national bank with capital of $75,000, and 2 weekly newspapers; and has machine-shops and foundries, manufactories of electric-light dynamos and engines, brick and tile factory, hard-wood and lumber mill, sash, door, and blind factory, milling and ginning establishment, box and ice factories, carriage and wagon shops, and other industries. Pop. (1880) 1,786; (1890) 2,762; (1900) 3,193.

"FORUM" PUBLISHING COMPANY.

West Point: town; capital of Cuming co., Neb.; on the Elkhorn river, and the Fre., Elk. and Mo. Val. Railroad; 38 miles N. W. of Fremont, 74 miles N. W. of Omaha (for location, see map of Nebraska, ref. 9–G). It is in a wheat and corn growing region; contains 2 national banks with combined capital of $100,000, a State bank with capital of $30,000, and 4 weekly newspapers; and has several woolen, grist, and paper mills, creamery, grain elevator, stockyards, brewery, and carriage and furniture factories. Pop. (1880) 1,009; (1890) 1,842; (1900) 1,890.

EDITOR OF "REPUBLICAN."

West Point: military post and seat of the U. S. Military Academy; Orange co., N. Y.; on the Hudson river, and the N. Y., Ont. and West., and the W. Shore railways; 52 miles N. of New York, 94 miles S. of Albany (for location, see map of New York, ref. 7–J). The eastern side of the Point is a nearly straight, precipitous shore, while the northern side, curving so as to form a bay at its western extremity, has a comparatively gentle slope, and commands a fine view up the river. On the northwestern part of this slope is Camp Town, containing barracks for soldiers, storehouses, etc. Farther N., at the extremity of a plain called the German Flats, is the cemetery, the burial-place of many distinguished officers of the army, and still a little to the N. is Washington's Valley, where stood the house occupied by Washington in 1779. The Military Academy is situated on a level terrace 160 feet above the river, flanked on the W. by rocky heights; of these the one on which stands the ruins of Fort Putnam is the nearest and most prominent. On the S. the heights approach the river, leaving only room for a road southward, leading to the village of Highland Falls and to Forts Montgomery and Clinton. A road westward over the mountains leads to Newburg and the surrounding country. The principal buildings of the academy are at the southern end of the terrace; the quarters of the officers and professors are on the west side and along the roads leading southward and westward. In the northern angle of the bend, opposite the Point, is Constitution island, a rocky mass rising 130 feet above the river, connected by a broad marsh with the east bank. Just N. of the island are the West Point Foundry and the village of Cold Spring; farther N. rises the lofty Bull Hill, with Breakneck in the distance. N. W. of the Point, on the west side of the river, are Crow Nest and Storm King, and beyond is the town of Newburg at the extremity of the upper reach of the river, which viewed from West Point appears like a mountain lake. The Government tract of land at West Point contains about 2,330 acres, most of which was purchased in 1790 from the son of one of the original patentees; the rest was purchased in 1824 and 1889. Jurisdiction was ceded by New York to the U. S. over a part of the tract in 1826, and over the remainder in 1875 and 1889. The Government also purchased in 1879 a tract of land of about 50 acres, including in this a small body of water, called Round Pond, used as an addition to the water-supply of the post, from which it is distant about 5 miles. In the war of the Revolution West Point and other advantageous sites on the Hudson were fortified for the purpose of holding control of the navigation of the river. A strong chain supported by a boom was stretched across the river to Constitution island, for the purpose of preventing the ascent of the river by the British war-vessels. For further information, see Boynton's *History of West Point*. See MILITARY ACADEMIES.

Revised by JAMES MERCUR.

West Point: town; King William co., Va.; at the confluence of the Pamunkey and Matapony rivers, and on the Southern Railway; 38 miles E. of Richmond (for location, see map of Virginia, ref. 6–I). It has regular steamship communication with Baltimore, New York, and Boston, a private bank, and a daily and two weekly newspapers; and is principally engaged in lumbering and oyster-packing. Pop. (1880) 557; (1890) 2,018; (1900) 1,307.

Westport: town (incorporated in 1835); Fairfield co., Conn.; on Long Island Sound, the Saugatuck river, and the N. Y., N. H. and Hart. Railroad; 45 miles N. E. of New York (for location, see map of Connecticut, ref. 12–D). It was set off from the towns of Fairfield, Norwalk, and Weston; contains the villages of Westport, Saugatuck, and Green's Farms; is engaged in agriculture and the manufacture of morocco, cotton twine, satchels, planes, and buttons; and has a high school and a weekly newspaper. In 1894 it had a grand list of $2,217,567. Pop. (1890) 3,715; (1900) 4,017. JOHN S. JONES, EDITOR OF "WESTPORTER-HERALD."

Westport: town (incorporated in 1787); Bristol co., Mass.; partly on the Atlantic Ocean; 8 miles S. of Fall River (for location of county, see map of Massachusetts, ref. 5–I). It contains the villages of Westport, North Westport, South Westport, Westport Factory, Head of Westport, Central Village, Westport Point, and Westport Harbor; has 3 summer hotels, 3 churches, high school, 19 district schools, and public library; and is engaged in agriculture, fishing, and manufacturing. In 1894 it had an assessed valuation of about $1,500,000. Pop. (1880) 2,894; (1890) 2,599; (1900) 2,890.

West Randolph: See RANDOLPH, VT.

Westropp, HODDER MICHAEL: archæologist; b. about 1825; graduated at Trinity College, Dublin, 1847; studied art in Italy, giving especial attention to religious archæology. D. at Ventnor, Isle of Wight, Apr., 1884. Among his works are *Epochs of Painted Vases, an Introduction to their Study* (1856); *A Handbook of Archæology, Egyptian, Greek, Etruscan, and Roman* (1867); *Influence of the Phallic Idea in the Religions of Antiquity* (1873); *Handbook of Pottery and Porcelain*; *Prehistoric Phases*; and *Lectures on Roman Archæology*, originally delivered before the Archæological Society of Rome.

West Rutland: town (set off from Rutland and organized in 1887); Rutland co., Vt.; on Otter creek, and the Del. and Hudson Railroad; 4 miles W. of Rutland, 54 miles S. W. of Montpelier (for location, see map of Vermont, ref. 7–B). By its separation from the former town of RUTLAND (*q. v.*) the principal marble quarries, for which the region is noted, came within its area. It contains a Baptist, Congregational, Methodist Episcopal, Protestant Episcopal, and two Roman Catholic churches. Its banking business is transacted in Rutland. Pop. (1890) 3,680; (1900) 2,914.

West Springfield: town (incorporated in 1774); Hampden co., Mass.; on the Connecticut and Agawam rivers, and the Boston and Albany Railroad; 2 miles W. of Springfield (for location, see map of Massachusetts, ref. 3–E). It contains the villages of West Springfield, Mittineague, and Merrick; has 5 churches, high school, 30 district schools, public library, and 3 hotels; and is principally engaged in agriculture and the manufacture of paper. In 1894 it had an assessed valuation of nearly $4,000,000. Pop. (1880) 4,149; (1890) 5,077; (1900) 7,105.

West Stockbridge: town (incorporated in 1774); Berkshire co., Mass.; on the N. Y., N. H. and Hart. Railroad; 10 miles N. of Great Barrington (for location, see map of Massachusetts, ref. 2–C). It contains the villages of West Stockbridge, Centre, State Line, Williamsville, and Rockdale Mills; has a Congregational, a Methodist Episcopal, and a Roman Catholic church, a public high school, eight district schools, and a public library; and is principally engaged in agriculture, iron-mining, and the manufacture of lime. Pop. (1880) 1,923; (1890) 1,492; (1900) 1,158.

West Troy, now **Watervliet**: village (incorporated in 1836); Albany co., N. Y.; on the Hudson river, and the Del. and Hudson Railroad; opposite Troy and 4 miles N. of Albany (for location, see map of New York, ref. 5–J). It is connected with Troy by an iron bridge across the river, accommodating electric cars for passengers and freight, and also by three lines of steam-ferry, and is connected with Albany by steam and electric railways. It is at one of the entrances of the Erie and Champlain Canals into the Hudson river, at the head of river navigation, and connected by river and canals with Lakes Erie, Ontario, and Champlain. The village is in a noted manufacturing region, is well laid out, and has streets paved with granite, thorough sewerage, improved water-works, and electric lights. There are 10 churches: Roman Catholic 3, Methodist Episcopal 2, Presbyterian 2, and Baptist, Protestant Episcopal, and Reformed, each 1; a parochial and 4 public schools, Union Free School library; a national bank with capital of $100,000; and a weekly newspaper. The industries comprise the manufacture of woolen goods, street-cars, bells, stoves, scales, car-journal bearings, harness-snaps, ladders, and sashes, doors, and blinds. The village receipts in 1894 were $69,533; the debt was $386,000; and the assessed property valuation, $4,337,346. Pop. (1900) 14,321. Here in 1807 the U. S. Government established an arsenal, known as WATERVLIET ARSENAL, on a reservation of 109 acres of ground within the present limits of the village. It has one of the largest plants for the construction of field, coast defense, and siege ordnance in the U. S., and also factories for the manufacture of shot and shell, gun-carriages, equipments for field and siege service, and small ammunition. Other buildings include two large stone magazines for storing powder and ammunition. During the Mexican and civil wars from 1,000 to 1,500 men and women were employed here day and night preparing materials of war, and since 1892 the foundry and construction-works have been kept busy on the great guns required for the army and for coast-defense works. The arsenal fronts the river and has a wharfage of about 1,000 feet. The reservation, through which the Erie Canal passes, has quarters for the officers, barracks for the soldiers and civilian employees, hospital, and tasteful gardens. West Troy was merged in the new city Watervliet in Aug., 1897.

West Union: city (founded in 1849); capital of Fayette co., Ia.; on the Burl., Ced. Rap. and N. and the Chi., Mil. and St. P. railways; 36 miles N. of Independence, 84 miles N. W. of Dubuque (for location, see map of Iowa, ref. 3–J). It is in an agricultural and dairying region, and has 11 churches, water-works, a national bank with capital of $100,000, 2 State banks with combined capital of $109,500, 2 large creameries, and 3 weekly newspapers. Pop. (1880) 1,551; (1890) 1,676; (1900) 1,935. EDITOR OF "GAZETTE."

West Virginia: one of the U. S. of North America (South Atlantic group); the twenty-second State admitted into the Union; capital, Charleston.

Location and Area.—It lies between lat. 37° 30′ and 40° 30′ N., lon. 0° 45′ and 5° 30′ W. of Washington; is bounded on the N. W. by Ohio, on the N., N. E., and E. N. E. by Pennsylvania and Maryland, on the E., S. E., and S. by Virginia, and on the S. W. by Virginia and Kentucky; area by U. S. census, 24,780 sq. miles, of which 135 sq. miles are water surface.

Physical Features.—On the eastern border of the State are the Alleghany Mountains proper, lofty spurs of which trend northwestward toward the Ohio. Three physical regions are clearly indicated: (1) The Eastern Plateau, on which is the loftiest mountain elevation in the State, and which embraces nine counties, viz., Mercer, Monroe, Greenbrier, Pocahontas, Randolph, Tucker, Pendleton, Hardy, and Hampshire. (2) The Central Plateau, which stretches across the State from N. to S., having a mean elevation of about 1,000 feet, and an average width of about 25 miles. On its southern portion, a northern continuation of the Cumberland range, are lofty elevations, some of the peaks of which, in Raleigh and Wyoming Counties, are estimated at from 3,000 to 3,500 feet in height. (3) The Ohio Valley Plain, along the Ohio river and the entire northwestern border of the State, from Wayne to Hancock Counties, in which are twelve of the most populous counties of the State. Here the elevation is from 575 to 850 feet. In addition to these there is what is called the Potomac region, which is drained by the upper waters of the Potomac, and in which are eight counties—Jefferson, Morgan, Berkeley, Hampshire, Mineral, Hardy, Grant, and Pendleton. The lowest depression W. of the mountains is at Kenova, at the mouth of Big Sandy river, which is 575 feet above the Gulf. At Charleston the altitude is 601 feet; Wheeling, 645; Grafton, 967; Clarksburg, 1,035; Lewisburg, in Greenbrier County, 2,200; Bluefield, in Mercer County (2,555); the Fairfax Stone, in Tucker County, 2,300; Big Sewell Mountain, in Fayette County, 3,500; Keeney's Knob, in Summers County, 3,700; Panther Knob, in Pendleton County, 4,000; Turkey Bone Mountain, in Randolph County, 4,210; and Spruce Knob, 4,860, which is the highest point of land in the State. In the Potomac region, E. of the mountains, the lowest depressions are at Harper's Ferry, where the elevation is but 279 feet above tide-water at Washington, and at Martinsburg 391 feet.

Seal of West Virginia.

Soil and Productions.—There are no transportation soils; all are native and come from the disintegration of limestones, sandstones, and various admixtures of shales and clays, forming, respectively, calcareous soil, sandy soil, and clayey soils and loams. These elements insure great fertility, and the lands are therefore productive to the very mountain-tops. Wheat, corn, and all the cereals yield abundantly. Almost all the fruits known to the temperate zone are grown, and fruit-culture is developing rapidly. The State lies central in the great Blue Grass region, which stretches from the banks of the Kentucky river to the lakes of Western New York.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms	62,674	72,773	16·1
Total acreage of farms	10,193,779	10,321,326	1·3
Value of farms, including buildings and fences	$133,147,175	$151,880,300	14·1

* Increase.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1900:

CROPS.	Acreage.	Yield.	Value.
Corn	714,804	19,299,708 bush.	$9,649,854
Wheat	454,377	4,452,895 "	3,428,729
Oats	131,831	2,768,451 "	941,273
Rye	12,171	127,796 "	81,789
Buckwheat	13,174	223,958 "	7,888
Potatoes	37,864	3,029,120 "	1,544,851
Tobacco	5,119	3,685,680 lb.	313,283
Hay	464,068	547,600 tons	7,337,840
Totals	1,833,408	.....	$23,305,507

On Jan. 1, 1900, the farm animals comprised 150,329 horses, value $6,495,281; 7,264 mules, value $378,309; 167,173 milch cows, value $4,747,713; 241,025 oxen and other cattle, value $6,061,432; 426,814 sheep, value $1,363,244; and about 400,000 swine, value $1,500,000—total head, 1,392,605; total value $20,545,979.

WEST VIRGINIA
County Towns
Scale of Miles
0 10 20 30 40 50
PENNSYLVANIA
MARYLAND
VIRGINIA
OHIO
KENTUCKY
MARSHALL
WETZEL
MONONGALIA
PRESTON
MARION
TYLER
PLEASANTS
WOOD
RITCHIE
DODDRIDGE
HARRISON
TAYLOR
BARBOUR
TUCKER
WIRT
LEWIS
GILMER
CALHOUN
UPSHUR
RANDOLPH
JACKSON
MASON
ROANE
BRAXTON
PUTNAM
CLAY
WEBSTER
CABELL
CHARLESTON
KANAWHA
NICHOLAS
POCAHONTAS
LINCOLN
WAYNE
BOONE
FAYETTE
GREENBRIER
LOGAN
RALEIGH
MINGO
WYOMING
SUMMERS
MONROE
MERCER
MCDOWELL
PENDLETON
HARDY
GRANT
MINERAL
HAMPSHIRE
MORGAN
BERKELEY
JEFFERSON
Caldwell
Sistersville
Friendly
Marietta
Williamstown
St. Marys
Pomeroy
Mason
Clifton
Hartford
West Columbia
New Haven
Ravenswood
Point Pleasant
Gallipolis
Henderson
Ripley
Spencer
Ironton
Catlettsburg
Kenova
Ceredo
Huntington
Barboursville
Guyandotte
Milton
Hurricane
St. Albans
Winfield
Buffalo
Kenova
Sheridan
Wayne
Fort Gay
Louisa
Dunlow
Inez
Prestonsburg
Pikeville
Williamson
Matewan
Thacker
Edgarton
Grundy
Welch
Elkhorn
Keystone
Iaeger
Bluefield
Princeton
Athens
Peterstown
Rainsburg
Salem
Roanoke
Bedford City
Lynchburg
Amherst
Fincastle
Lexington
Covington
Staunton
Warm Springs
Monterey
Harrisonburg
Luray
Washington
Warrenton
Front Royal
Woodstock
Winchester
Berryville
Leesburg
Charles Town
Shepherdstown
Harpers Ferry
Hagerstown
Cumberland
Oakland
Grafton
Buckhannon
Elkins
Beverly
Petersburg
Moorefield
Romney
Keyser
Martinsburg
Berkeley Springs
Bedington
Falling Waters
Longitude West from Greenwich
NORTHERN PART OF WEST VIRGINIA
Same scale as main map
Fairview
New Cumberland
Penrith
Hollidays Cove
Steubenville
Colliers
Lazearville
Wellsburg
Bethany
Wheeling
Straitsville
West Liberty
Elmgrove
Triadelphia
Benwood
McMechen
Moundsville
Waynesburg
Glen Easton
Cameron
Woodsfield
New Martinsville
Littleton
Hundred
Blacksville
Cassville
Sistersville
Friendly
Pinegrove
Mannington
Amos
Rivesville
Middlebourne
Smithfield
L.L. POATES, ENGR., N.Y.

Mineral Resources.—The State has a coal area of 16,000 sq. miles, divided into five districts, viz., the Flat Top, Kanawha, New River, Northern, and Upper Potomac, and in 1899 ranked fourth in production, the output being 19,252,995 short tons, valued at $12,053,268. The same year the State ranked second in production of petroleum, having an output of 13,910,630 barrels, valued at $18,014,766. This petroleum is identical with that of Pennsylvania, excepting a portion of that from the Volcano and Burning Springs districts, which yield a natural lubricating oil of high grade. The total production in the State to the close of 1899 was 87,815,150 barrels. The production of salt, of the common fine and common coarse grades, was 247,668 barrels; value, $88,462. The quarry products were limestone, valued at $58,802, and sandstone at $33,860. The value of the natural gas consumed was $2,335,864. There were seven mineral springs whose waters were bottled for commercial use, with a product valued at $18,305, and twelve mineral spring resorts. The iron-ore production of Virginia and West Virginia together was 986,476 long tons, valued at $1,766,410.

Climate.—The climate is salubrious and agreeable. The warm season is long, but the heat is not intense. At Morgantown, in the north, the mean temperature of winter ranges from 34° to 42°, and of summer from 70° to 75°, and in the southern part of the State the range is from 2° to 5° higher. The mean annual temperature of the whole State is 56·4°, and the average rainfall 44·2 inches, Lewisburg, with an elevation of 2,200 feet, having 35·75 inches, and Kanawha Salines, elevation about 570 feet, 55·84 inches.

Divisions.—For administrative purposes the State is divided into fifty-five counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Barbour	6-I	12,702	14,198	Philippi	665
Berkeley	5-M	18,702	19,469	Martinsburg	7,564
Boone	.....	6,885	8,194	Madison	.....
Braxton	8-G	13,928	18,904	Sutton	864
Brooke	3-H	6,660	7,219	Wellsburg	2,588
Cabell	9-D	23,595	29,252	Huntington	11,923
Calhoun	7-F	8,155	10,266	Grantsville	225
Clay	8-F	4,659	8,248	Clay	.....
Doddridge	6-G	12,183	13,689	West Union	623
Fayette	10-F	20,542	31,987	Fayetteville	413
Gilmer	7-G	9,746	11,762	Glenville	398
Grant	6-K	6,802	7,275	Petersburg	.....
Greenbrier	10-H	18,034	20,683	Lewisburg	872
Hampshire	5-L	11,419	11,806	Romney	580
Hancock	2-G	6,414	6,693	New Cumberland	2,198
Hardy	6-K	7,567	8,449	Moorefield	460
Harrison	6-H	21,919	27,690	Clarksburg	4,050
Jackson	7-E	19,021	22,987	Ripley	579
Jefferson	5-M	15,553	15,935	Charlestown	2,392
Kanawha	9-E	42,756	54,696	Charleston	11,099
Lewis	7-H	15,895	16,980	Weston	2,560
Lincoln	9-D	11,246	15,434	Hamlin	.....
Logan	10-D	11,101	6,955	Logan ‡	3,272
McDowell	12-E	7,300	18,747	Welch	442
Marion	5-H	20,721	32,430	Fairmont	5,655
Marshall	4-G	20,735	26,444	Moundsville	5,362
Mason	7-D	22,863	24,142	Point Pleasant	1,934
Mercer	11-F	16,002	23,023	Princeton	.....
Mineral	5-K	12,085	12,883	Keyser	2,536
Mingo †	10-D	.....	11,359	Williamson	.....
Monongalia	4-H	15,705	19,049	Morgantown	1,895
Monroe	11-H	12,429	13,130	Union	256
Morgan	5-L	6,744	7,294	Berkeley Springs	781
Nicholas	9-G	9,309	11,403	Summersville	223
Ohio	3-G	41,557	48,024	Wheeling	38,878
Pendleton	8-J	8,711	9,167	Franklin	205
Pleasants	6-F	7,539	9,345	St. Mary's	825
Pocahontas	9-H	6,814	8,572	Marlinton	171
Preston	5-I	20,355	22,727	Kingwood	700
Putnam	8-D	14,342	17,330	Winfield	338
Raleigh	10-F	9,597	12,436	Beckley	342
Randolph	8-I	11,633	17,670	Beverly	464
Ritchie	6-F	16,621	18,901	Harrisville	472
Roane	8-F	15,303	19,852	Spencer	737
Summers	11-G	13,117	16,265	Hinton	3,763
Taylor	6-I	12,147	14,978	Grafton	5,650
Tucker	6-J	6,459	13,433	Parsons	618
Tyler	6-G	11,962	18,252	Middlebourne	.....
Upshur	8-H	12,714	14,696	Buckhannon	1,589
Wayne	9-D	18,652	23,619	Wayne	.....
Webster	8-H	4,783	8,862	Addison	297
Wetzel	4-G	16,841	22,880	New Martinsville	1,089
Wirt	7-F	9,411	10,284	Elizabeth	657
Wood	6-E	28,612	34,452	Parkersburg	11,703
Wyoming	11-E	6,247	8,380	Oceana	187
Total	.....	762,794	958,800		

* Reference for location of counties, see map of West Virginia.
† Formed since census of 1890. ‡ District.

Principal Cities and Towns, with Population for 1900.—Wheeling, 38,878; Huntington, 11,923; Parkersburg, 11,703; Charleston, 11,099; Martinsburg, 7,564; Fairmont, 5,655; Grafton, 5,650; Moundsville, 5,362; Bluefield, 4,644; Benwood, 4,511; Clarksburg, 4,050; Hinton, 3,763; Sistersville, 2,979; Wellsburg, 2,588; Weston, 2,560; Keyser, 2,536.

Population and Races.—In 1860, 376,688; 1870, 442,014; 1880, 618,457; 1890, 762,794 (native, 743,911; foreign, 18,883; male, 390,285; female, 372,509; white, 730,077; colored, 32,717, including 32,690 persons of African descent).

Industries and Business Interests.—The census returns of 1890 showed that 2,376 manufacturing establishments reported. These had a combined capital of $28,118,030; employed 21,969 persons, to whom $8,330,997 was paid in wages; used materials that cost $23,729,089; and had an output valued at $38,702,125. The principal industries, according to the value of output, were the manufacture of iron and steel, $7,490,934; lumber-mill products from logs or bolts, $5,239,340; flour and grist mill products, $3,902,994; nails and spikes, $3,140,931; refined petroleum, $1,171,374; coke, $1,130,762; glass, $945,234; planing-mill products, $910,640; tanned and curried leather, $896,120; malt liquors, $747,402; cigars and cigarettes, $562,060; and foundry and machine-shop products, $506,513. In 1893 there were 4 iron-furnaces, 6 rolling-mills and steel-works, 856 cut-nail machines, and a wire-nail works in operation. The production of pig iron was 187,858 long tons in 1899. The coke industry in 1899 had 87 establishments, with an aggregate of 8,846 ovens and 619 in process of building. During the year 3,802,825 short tons of coal were used, and 2,278,577 short tons of coke produced, valued at $3,480,408. Coal-mining is the distinctive industry of the State.

Finance.—The State has no bonded debt. In 1894 the assessed valuations were $197,239,963. The State tax rate was 35 cents per $100. The total receipts for the fiscal year ending Sept. 30, 1900, were $1,806,015.54; the disbursements, $1,790,478.25.

Banking.—In 1900 there were 40 national banks, with combined capital of $3,849,660, surplus and profits of $1,533,983, and deposits of $15,548,822.68; 83 State banks, capital $3,201,396, surplus and profits $1,563,853, and deposits $18,999,142; and 1 mutual and 5 stock savings-banks with $248,280 capital, $98,511 surplus and profits, and $1,926,407 in savings-deposits from 12,369 depositors.

Means of Communication.—In 1894 the State had 1,847 miles of railway. Three great trunk lines cross the State from E. to W., connecting the commerce of the East with that of the Mississippi valley. These lines are the Baltimore and Ohio, the Chesapeake and Ohio, and the Norfolk and Western. In addition to these there are several local lines of importance, including the Ohio River, the West Virginia Central and Pittsburg, the West Virginia and Pittsburg, and the Cumberland Valley and Martinsburg railways. The total mileage in 1899 was 2,178·39.

Churches.—The census of 1890 gave the following statistics of the religious bodies having each a membership in the State of over 1,000:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Methodist Episcopal North	827	822	48,925	$902,153
Baptist, Regular, North	458	459	34,154	381,200
Methodist Episcopal South	482	410	25,064	382,250
Roman Catholic	67	67	15,653	340,155
United Brethren in Christ	259	254	12,242	140,645
Methodist Protestant	230	222	10,652	153,545
Presbyterian in the U. S.	87	109	5,995	222,950
Disciples of Christ	85	83	5,807	92,292
Presb. in the U. S. of America	44	41	4,275	308,200
Baptist, Regular, Colored	79	79	4,233	59,090
Protestant Episcopal	61	66	2,906	276,687
Baptist, Free-will	32	31	1,668	34,000
Lutheran, United Synod in the So.	21	22	1,518	33,725
Lutheran, General Synod	5	5	1,108	69,000

Schools.—The public-school system embraces primary, graded, high, and normal schools, and a State University. The legal school age is from six to twenty-one years. In 1898 there were 302,354 children of school age, of whom 236,188 were enrolled in the public schools. There were 5,856 schools and 6,808 teachers. The school property was valued at $3,471,697; the total revenue for school purposes was $1,933,718; the expenditure, $2,046,623. The State Normal School—Marshall College—is located at Huntington, with branches at Fairmount, Glenville, Shepherdstown, West Liberty, and Concord. These schools had 1,030 students. A Colored Institute is maintained at Farm. The State University, open to both sexes, at Morgantown, is one

of the most thoroughly equipped institutions of its kind in the South, and in 1900 had 57 instructors, 885 students, and 15,200 volumes in its library.

Libraries.—According to U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, West Virginia had 7 libraries, containing 36,980 bound volumes and 3,128 pamphlets. The libraries were classified as follows: General, 2; college, 2; and school, law, and historical, each 1. In 1894 a State museum was opened to the public in the Capitol. It contains the exhibit of the State at the World's Exposition in Chicago and the collections of the State Historical and Antiquarian Society.

Post-offices and Periodicals.—In Jan., 1901, there were 1,994 post-offices, of which 43 were presidential (1 first-class, 11 second-class, and 31 third-class), and 1,951 fourth-class. Of the total 396 were money-order offices and 13 were money-order stations. There were 20 daily, 2 semi-weekly, 154 weekly, 1 bi-weekly, 2 semi-monthly, 11 monthly, and 1 quarterly periodicals—total, 191.

Charitable, Reformatory, and Penal Institutions.—These include a penitentiary, at Moundsville; Reform School for males, at Pruntytown; School for the Deaf and Blind, at Romney; First Hospital for the Insane, at Weston; and Second Hospital for the Insane, at Spencer.

Political Organization.—The Governor, auditor, State superintendent of free schools, treasurer, and attorney-general, all elected for four years, constitute the executive department, and also compose the board of public works. The Legislature consists of a senate of 26 members, each elected for four years (half every two years), and a house of delegates of 71 members, each elected for two years. Sessions of the Legislature are held biennially, and limited to forty-five days. The judiciary department comprises the supreme court of appeals, circuit courts, corporation courts, and justices of the peace. The supreme court of appeals is composed of four judges elected for twelve years, three of whom make a quorum. Three terms of the court are held annually, one each at Charleston, Wheeling, and Charlestown. There are thirteen judicial circuit courts and fourteen circuit judges, each elected for eight years. A circuit court is held three times a year in each county, and special terms are authorized. A judge of any circuit may, upon request, hold court in any other circuit. Corporation courts, having special jurisdiction, are established in cities or towns. Criminal courts, having jurisdiction in criminal matters only, are established in counties and cities where required. Each county is divided into magisterial districts, with not less than three nor more than ten in any county, and each district elects one justice, or if the population exceeds 1,200, two. These justices have jurisdiction in misdemeanor and civil cases to the extent of $300, but not in felonies.

History.—The territory now embraced in West Virginia was first visited by a white man, John Lederer, in 1669–70, when he was in the service of Gov. Berkeley as an explorer. The same year Robert Chevalier La Salle saw the western part of the State when descending the Ohio river. The Knights of the Golden Horseshoe accompanied Gov. Spotswood, of Virginia, over the Blue Ridge in 1716. John Van Metre traversed the valley of the south branch of the Potomac about 1725. The first white man to make a home within the present limits of the State was Morgan Morgan, who built his cabin in what is now Berkeley County, in 1727. The land grant of Lord Fairfax, for the "Northern Neck" of Virginia, extended far into what is now West Virginia, and the Fairfax surveyors, on Oct. 17, 1746, planted the "Fairfax Stone" at the head waters of the north branch of the Potomac to mark the western limit of the grant. France laid claim to all that part of the State W. of the mountains, basing her title upon the right of discovery, and when the English began to cross the mountains, France sent an expedition from Canada to bury leaden claim plates at the mouths of the principal tributaries of the Ohio. In the French and Indian war of 1755 Gen. Braddock marched through the eastern part of the State to the fatal field of Monongahela. The Shawnee Indians had numerous towns and villages in this region, but the title to all the territory included in the State appears to have been vested in the Six Nations, for by them the land was ceded to the King of England by the treaty of Fort Stanwix, now Rome, N. Y., in 1768. The Shawnees, Delawares, Mingoes, and other tribes N. of the Ohio, however, claimed that the territory thus ceded belonged to them, and refusing to yield it waged war along the Virginia border from the date of cession until the treaty of Greenville in 1795. In this period there were many bloody engagements on the soil of West Virginia, and at Point Pleasant, at the mouth of the Great Kanawha, on Oct. 10, 1774, occurred the most desperate battle ever fought with the Indians in Virginia. When the Revolutionary war opened the pioneers of this region were the first troops from the south side of the Potomac that joined Washington at Boston. At the beginning of the war of 1861–65, when Virginia passed the ordinance of secession, a majority of the people W. of the mountains resolved to remain in the Union, and early set about the formation of a new State. Meetings were held in several counties, but the first one, the object of which was to secure united action, met at Clarksburg on Apr. 22, 1861. The first Wheeling convention was held in May following, and the second Wheeling convention, which met on June 11, provided for the organization of a new State. On June 20, 1863, West Virginia was admitted to the Union. The present constitution was adopted in 1871. Under an appropriation of $3,885,200 the U. S. Government is creating slackwater navigation on the Big Kanawha river by means of locks and dams, from the Ohio river at Point Pleasant to a point near Kanawha Falls in Fayette County, a distance of 90 miles.

GOVERNORS OF WEST VIRGINIA.

Arthur I. Boreman	1863–69	A. Brooks Fleming	1890–93
William E. Stevenson	1869–71	William A. MacCorkle	1893–97
John J. Jacobs	1871–77	George W. Atkinson	1897–1901
Henry M. Mathews	1877–81	Albert B. White	1901–
Jacob B. Jackson	1881–85		
E. Willis Wilson	1885–90		

AUTHORITIES.—Lewis, *History of West Virginia* (Philadelphia, 1889); Norris, *History of the Lower Shenandoah Valley* (Chicago, 1890); Brock, *The Dinwiddie Papers* (Richmond, 1883); Wiley, *History of Monongalia County* (Kingwood, 1883); Hale, *Trans-Allegheny Pioneers* (Cincinnati, 1886); Newton, *History of the Pan-Handle* (Wheeling, 1879); Maxwell, *History of Tucker County* (Kingwood, 1884); Michaux, *Alleghany Mountains* (London, 1805); Fernow, *The Ohio Valley in Colonial Days* (Albany, 1890); Heckewelder, *Manners and Customs of the Indian Nations* (Philadelphia, 1876); Withers, *Chronicles of Border Warfare* (Clarksburg, 1831); Chapman, *The French in the Alleghany Valley* (Cleveland, 1887); *Calendar of Virginia State Papers* (Richmond).

VIRGIL A. LEWIS.

West Virginia University: an institution established in 1867 with the proceeds of the congressional land grant of July 2, 1862. It is located at Morgantown, in the northwestern portion of the State. It has property worth about $300,000, an endowment of $115,000, and receives from the U. S. Government $34,000 annually for agricultural experiment station work, and $20,000 from the Morrill fund. It has eight academic schools, five professional and technical schools, and several special courses. It offers seven courses for degrees. It has a faculty of fifty-seven professors, besides the staff of the experiment station. It is finely equipped for work in its civil, mining, and mechanical engineering departments, and for agriculture and horticulture. Tuition is free to West Virginian students. For the session of 1899–1900 there were 885 students enrolled.

P. B. REYNOLDS.

Wethersfield: town (settled in 1635); Hartford co., Conn.; on the Connecticut river, and the N. Y., N. H. and Hart. Railroad; 3 miles S. of Hartford (for location, see map of Connecticut, ref. 8–H). It contains the villages of Wethersfield and South Wethersfield; is connected with Hartford by electric railway and with Hartford and New York by a daily steamboat line in the open season; has the State prison, a high school, public library, the Webb house where Washington and Rochambeau met in 1781, and a monthly periodical; and is engaged in agriculture, packing and shipping garden seeds, and the manufacture of copying-presses and mattresses. Pop. (1880) 2,173; (1890) 2,271; (1900) 2,637.

Wette, WILHELM MARTIN LEBERECHT, de: See DE WETTE.

Wetter, *vet'ter*: the second largest lake of Sweden; 80 miles long, 13 miles broad; area, 733 sq. miles. It is 290 feet above the sea, and sends its surplus water to the Baltic through the Motala. It is connected with Lake Wener by canal.

Wettstein, *vet'stīn*, JOHANN JACOB: New Testament critic; b. at Basel, Switzerland, Mar. 5, 1693; studied theology; was appointed field-preacher to a Swiss regiment in the Dutch service, and in 1717 deacon in the Reformed church of his native city. From this office he was dismissed in 1730 on

account of deviations from the accepted Reformed creed, and in 1733 became Professor of Church History in the Remonstrants' College in Amsterdam, where he died Mar. 22, 1754. His principal works are *Prolegomena ad Novi Testamenti Græci Editionem accuratissimam* (1730; reprinted and re-edited by J. Semler, Halle, 1764) and a critical edition of the New Testament (2 vols., Leyden, 1751–52), in which "he did not venture to put new readings in the body of his page, but consigned those of them which he recommended to a place between the text and the full list of various readings. Beneath the latter he gave a commentary consisting principally of a mass of invaluable illustrations and parallels drawn from classical and rabbinical literature, which has formed a storehouse for all later commentators."
Revised by S. M. Jackson.

Wexford: county of Ireland, province of Leinster; bordering E. on St. George's Channel and S. on the Atlantic. Area, 901 sq. miles. In the northern part the surface is elevated, and rises in Mt. Leinster and Blackstairs, but from this ridge it gradually slopes down into a level plain, which along the coast is fringed with swamps and marshes. The soil is fertile, and better cultivated than in most parts of Ireland. Good crops of wheat, barley, oats, and potatoes are gathered, and cattle-breeding, dairy-farming, and fishing are carried on with success. Pop. (1891) 111,778.

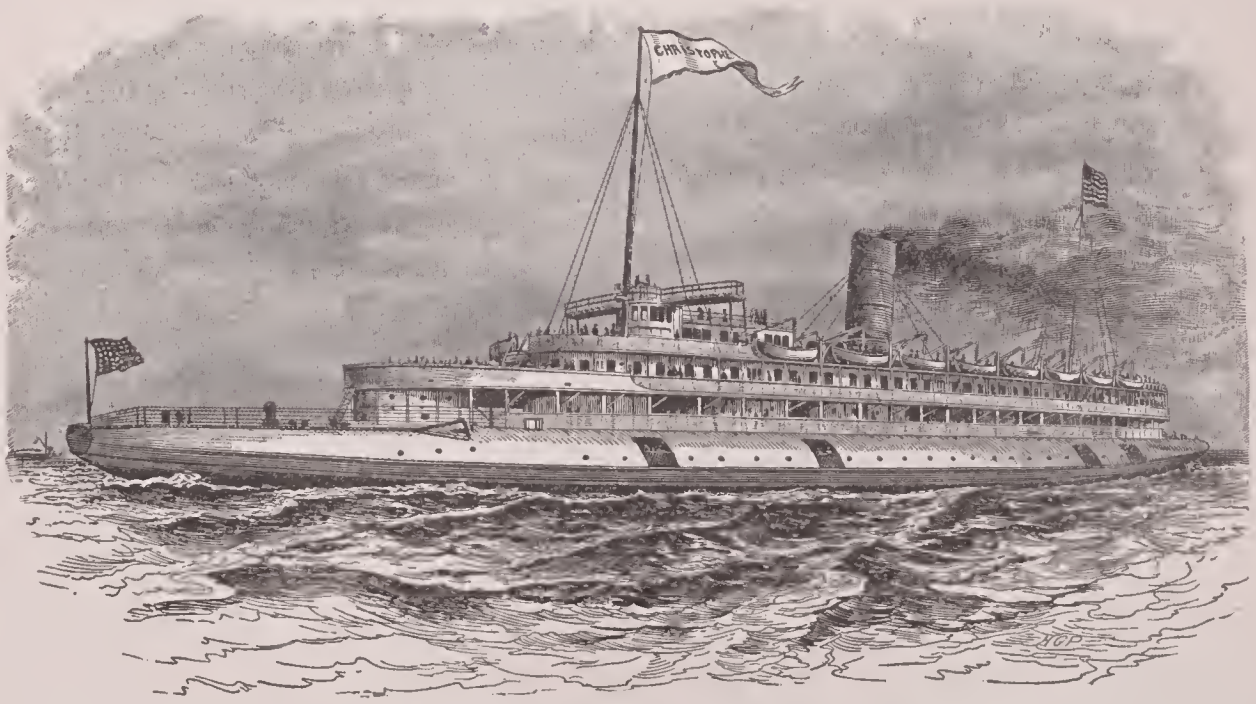
Wexford: capital of the county of Wexford, Ireland; on the right bank of the Slaney, which here is lined with a handsome quay; 93 miles by rail S. of Dublin (see map of Ireland, ref. 12–I). Its harbor is shallow, and accessible only for small craft; still its export trade in agricultural and dairy produce is important. It was an early Danish settlement, and was also one of the earliest landing-places of the Anglo-Norman invaders. Pop. (1891) 11,541.

Weyden, wī'den, Rogier van der, also called Rougelet de la Pasture and Rogereus de Pascius: painter; b. at Tournay, Belgium, about 1400. He was the founder of the Brabant school of painting, which had its center in Brussels. In 1426 he was apprenticed to Robert Camdin, of Tournay, to learn painting, but he may have practiced some other form of art previous to this. In 1432 he was enrolled as master in the Painters' Guild at Tournay. In 1436 he was elected town painter of Brussels, and painted about this time the four subjects in the Golden Chamber of the Hôtel de Ville illustrative of Justice, so much admired by contemporaries. These were destroyed by a fire which consumed part of the building during the French bombardment in 1695. He went to Italy in 1449, probably at the invitation of Leonello d'Este, of Ferrara, for whom he worked. In 1450 he was at Rome during the great jubilee held by Pope Nicholas V. He painted for the great Italian patrons of art—the Sforzas, the Medici, and Alfonso, of Naples—and he aided in spreading the northern method of oil-painting through Italy, where his work was extremely admired. On his return to Brussels commissions were unceasing. He had married at Tournay while young, and had several children, but in 1462 he and his wife entered a holy fraternity. He died in Brussels, June 16, 1464, and was buried in the Church of St. Gudule. The chief pictures remaining of this artist are as follows: a *Descent from the Cross*, in the Madrid Gallery; a triptych in the Berlin Gallery, painted for the Carthusian convent of Miraflores, near Burgos, Spain; also a triptych representing St. John the Baptist; a replica of the latter, in the Staedel Institute, at Frankfort-on-the-Main; also a Madonna, with saints bearing the Medici arms; a triptych in the Belvedere of Vienna; a triptych representing *The Last Judgment*, in the hospital at Beaune; a *Deposition* in the Uffizi, at Florence, supposed by Crowe and Cavalcaselle to be part of the triptych painted for Leonello d'Este; a triptych in Grosvenor House, London. *The Seven Sacraments*, at Antwerp, is not accepted by some authorities as Rogier's work. The London National Gallery contains two works by this master. The influence of Rogier van der Weyden is recognizable in the works of Dietrick Bouts, Hans Memline, Martin Schöngauer, and many other artists less known to fame. See Crowe and Cavalcaselle, *Early Flemish Painters* (1857; 3d ed. 1879); the monograph by Wauters (Brussels, 1856); and Pinchart's *Roger de la Pasture*, *Bulletin des Commissions Royales d'Art et d'Archéologie*, vol. xi., p. 408 (Brussels, 1867).
W. J. S.

Weymouth, wā'mŭth: town (settled in 1623, incorporated in 1635); Norfolk co., Mass.; on the south shore of Boston Harbor, and on two branches of the Old Colony System of the N. Y., N. H. and Hart. R. R., and the Quincy and Boston and Braintree electric railways; 12 miles S. of Boston (see map of Massachusetts, ref. 3–I). The town contains 7 villages (with a post-office in each), and has 16 churches, 2 high, 8 grammar, and several graded schools, Tufts Library (containing over 16,000 volumes), 2 national, 3 savings, and 2 co-operative banks, a weekly newspaper, and manufactures of boots and shoes, fireworks, hammocks, and phosphates. Pop. (1880) 10,570; (1890) 10,866; (1900) 11,324.

Whale [M. Eng. *whal* < O. Eng. *hwæl*: Germ. *wal*, *walfisch*: Icel. *hvalr*. Cf. Walrus]: any one of several large Cetaceans, representing several different families, and even different sub-orders. The only character shared in common by them, independent of those characteristic of the order, is the large size. The families to which the forms thus distinguished belong are, of the whalebone whales or *Mysticete*, families *Balænopteridæ* and *Balænidæ*; and of the toothed whales, the families *Physeteridæ* and *Ziphiidæ*. The large species of *Delphinidæ* are also known as whales—e. g. *Delphinapterus beluga*, called the White Whale (*q. v.*), and the species of *Globicephalus*, generally designated as blackfish, etc. See Whale-fishery and Whalebone Whales.

Whaleback Steamers: vessels in which the hull has a form roughly resembling the back of a whale. The designer was Alexander McDougall, a sea-captain of Duluth, Minn., who brought them out about 1890. In two years he had constructed, mainly for use on the Great Lakes of North America, vessels of this class having an aggregate tonnage of 70,000. They proved to be very moderate in their demand for power, and were soon successful commercially. The section of the vessel is oval, the decks as well as the bilges are rounded, and, driven by steam-power solely, unhampered by masts and sails, the steamers are both easy to propel and quiet in motion. The seas are taken over them without obstruction, and produce no effect upon the movement of the ship. It is also claimed that their form gives peculiar facilities for securing good workmanship, and a



A whaleback steamer, the Christopher Columbus.

tight as well as singularly strong hull. Whaleback steamers have been used mainly as grain-carriers, but the Christopher Columbus, a steamer of about 3,000 tons burden, was employed throughout the period of the World's Columbian Exposition, in Chicago in 1894, to carry passengers between the city and the Exposition-grounds, and proved a very satisfactory vessel for that work. Later she plied as a passenger-steamer between Chicago and Milwaukee. This ship is 362 feet over all, 42 feet beam, and 24 feet deep, driven by triple-expansion engines of 2,600 horse-power. Her average speed is nearly 20 miles an hour. The shipyard where these vessels are built is at West Superior, Wis.

R. H. Thurston.

Whalebone: the horny, elastic laminæ obtained from whales of the sub-order *Mysticete*, although the best, and practically all that is used, comes from the right whale (*Balæna mysticetus*). It is attached to either side of the upper jaw, with the fibrous portion in and unbroken edges out, thus forming a sort of filter through which the water passes as it is expelled from the jaws, the small fish, etc., which comprise the food of the animal, being thus retained. Its fibers have very little lateral cohesion, and can easily be removed in the form of long filaments; the blades, 300 of which are sometimes present on each side of the mouth, are arranged in parallel series, resembling somewhat the roof of a house in shape; they are usually about 8 to 12 feet in length, 10 to 12 inches in breadth, and ½ inch in thickness. In the manufacture of useful articles from whalebone the blade is first cut in parallel prismatic slips, which are then dried and leveled by planing, the shavings being sometimes utilized as a stuffing for mattresses. When heated by steam it softens, and can then be bent or moulded in forms which it retains if allowed to become cool under pressure. The essential constituent of whalebone appears to be albumen, its hardness being probably increased by the small proportion of calcium phosphate. Whalebone has been employed for the ribs of umbrellas and parasols, stiffening of stays, framework of hats, and in the manufacture of whips, canes, ramrods, archery bows, fans, screens, etc.; but steel rods have been substituted for it for several of these purposes with improved results. Revised by F. A. Lucas.

Whalebone Whales: whales distinguished by the possession of whalebone. This substance is a peculiar epidermal development arising from each side of the median line of the roof of the mouth, and may be looked upon as modified hair. Teeth are existent in a rudimentary condition in the fœtus, but are not functionally developed, and are absorbed and disappear before birth; the supramaxillary bones are not extended backward over the frontal bones, but are produced outward in front of the orbits; the olfactory organ is distinctly developed, and the nasal bones project forward, and are not overlapped at their distal ends; the lower jaw has its rami bowed out, and connected at their simphyses by fibrous tissue, and not by suture. They are distinguished from the toothed whales chiefly in that the head is more depressed above toward the margin of the jaw, the eyes situated nearly above the angle of the mouth, and the lower jaw and throat more baglike. The forms thus combined exhibit two primary modifications of structure, which by some are considered as of family value, but by others as indicative of only sub-family rank:

(1) The typical whalebone whales (*Balænidæ*) have the skull greatly arched at the maxillary region, and the rostrum narrow and compressed at the base; the frontals have the orbital processes prolonged, and extremely narrow and rounded on the upper surface; the supramaxillary bones are entire at their posterior margins; the tympanic bones large and ovoid; the lower jaw has the coronoid processes almost obsolete; the cervical vertebræ are coalesced together; and the manus is comparatively broad, and has five fully developed fingers.

(2) The finback, humpback, and scragg whales (*Balænopteridæ*) have the skull but slightly arched at the maxillary region; and the rostrum broad at the base, depressed, and gradually tapering; the frontals have the orbital processes moderately prolonged, broad, and flat on the upper surface; the supramaxillary bones are deeply excavated at their posterior margins; the tympanic bones elongated and ovoid; the lower jaw has the coronoid processes more or less developed; the cervical vertebræ in whole or in part separated; and the manus is narrow, and only four digits are developed, the first being wanting.

To the family *Balænidæ* belong the bowhead or Greenland whale and several distantly related species inhabiting warmer and Antarctic waters, which have been differentiated, but probably on insufficient grounds, into as many as six genera. The bowhead is the most valuable of all the whales from a commercial point of view, and is the species especially hunted by the whalemen fitted out for the Arctic seas. Although not the longest, it is the stoutest of known species; its head is proportionately larger and more ungainly than any other of the sub-orders, and forms about one-third of the animal's entire length. Individuals occasionally reach a length of 60 or 70 feet, although not often found much exceeding 50. In proportion to its size it is the richest in oil-giving characters; individuals have been known to yield nearly 300 barrels. Its whalebone, which is of a black color, and developed in strips gradually attenuated toward the end, is also the most esteemed, and 3,500 lbs. or more have been obtained from a single individual. It is a timid animal, and rarely turns upon its pursuers, as do some of the species of *Balænopteridæ*. "Sometimes, when engaged in feeding, it remains down for twenty-five minutes or more. The depth to which the animal descends when pursued is not accurately known, for, as a general rule, it has been captured 'on soundings' in the Arctic Ocean and Bering Sea, as well as in the Sea of Okhotsk, where the depths in places do not exceed 100 fathoms, and from that to less than 50. Sometimes it has been taken in very shallow water; yet this animal when in deep water has been known to 'sound out' a line, in its descent and return, equal to a mile in length." (*Scammon.*) The species is now sought for chiefly in Bering Sea, and in the Arctic Ocean N. of it. According to Scammon, "the bowheads of the Arctic may be classed as follows: 1st class—the largest whales, of a brown color; average yield of oil, 200 barrels; 2d class—smaller, color black; yield of oil, 100 barrels; 3d class—the smallest, color black; yield of oil, 75 barrels. Those belonging to the last-named class are generally found among the broken floes, the first of the season, and they have been known to break through ice three inches in thickness, that had been formed over water between the floes. They do this by coming up under and striking it with the arched portion of their heads." Hence they have been called ice-breakers. The whalers strive to be on their hunting-grounds in the early summer, and they frequently reach the latitude of 72° N., and sometimes, in open seas, even beyond.

The family of *Balænopteridæ* is much richer in forms and decided contrasts than the *Balænidæ*. There are three primary types. In the *Balænopterinæ* the throat is longitudinally plicated; a high, erect, and more or less falcate dorsal fin exists; the frontal bones have orbital processes nearly as broad at the outer extremity as the base, and somewhat narrowed; the manus is moderate, and has four digits, none of which have more than six phalanges. These are mostly very large whales, which have been grouped under the generic names *Balænoptera*, *Physalus*, *Sibbaldius*, and *Rudolphius*. The *Megapterinæ* have also the throat longitudinally plicated, but the dorsal fin developed as a mere hump; the manus is very long, and the digits are segmented into many phalanges: these are the humpback whales, which have been grouped under the genera *Megaptera*, *Poescopia*, and *Eschrichtius*. Finally, the *Agaphelinæ* are characterized by the plications of the throat being obsolete, and not more than two in number, and by the dorsal fins being entirely undeveloped. To this group belong the genera *Agaphelus* of the Atlantic Ocean, and *Rhachianectes* of the Pacific. The most gigantic of known cetaceans belong to the family and to the genera *Physalus* and *Sibbaldius*. The *Sibbaldius sulfureus* of the western coast of America has been reported to reach an equally great length. The body in these animals is relatively slender, and they are capable of great speed. Fourteen species have been credited to the American coasts. Revised by F. A. Lucas.

Whale-fishery: the capture of whales for commercial purposes. It is an industry of long standing, the first recorded whale-fishery having been carried on along the Basque coasts of France and Spain, where, as early as the tenth century the southern right whale, *Balæna biscayensis*, was pursued in the Bay of Biscay. About the end of the sixteenth century the supply of these whales began to fail, and a little later the species was all but exterminated on the coast of Europe. At this time, however, the Greenland or right whale, *Balæna mysticetus*, a larger animal with more oil and better whalebone, was discovered, and the whale-fishery was promptly transferred to the Arctic Ocean in the

vicinity of Spitzbergen, where the Dutch established a village by the name of Smeerenberg for trying out the oil. After the extermination of the whales in that vicinity the fishery was carried on along the shores of Greenland; Smeerenberg was abandoned, and the blubber taken to Holland. At this period the Dutch led in the whale-fishery, and in 1680 260 ships and 14,000 sailors were engaged in the industry. The Dutch and French fisheries were destroyed by the wars at the close of the eighteenth century, during which England held possession of the North Sea, and from that time on the English have stood first in Europe, reaching the highest point about 1815, when 154 vessels were employed in whaling. Since then the business has declined, and at present Dundee and Peterhead are the only two whaling-ports in the United Kingdom. The American whale-fishery may be said to date from the settlement of New York and New England, one of the arguments for settling on Cape Cod being the presence of large whales of the best kind for oil and bone. At its inception whaling seems to have been carried on in a somewhat desultory manner, by boats from shore, or by small vessels, and, judging from the number of laws on the subject, and the importance attached to whales picked up adrift, it would appear that whales were frequently killed, or mortally wounded and then left to wash ashore or to be secured later. In 1644 the town of Southampton, L. I., was systematically divided into wards to watch for whales which might come ashore, and by 1669 the whale-fishery was actively prosecuted in that locality, twelve whales having been taken by the end of March. By 1700 Nantucket, or Sherburne, as it was then called, had advanced to the first rank as a whaling-port, and in 1726 shore-whaling reached its highest mark, eighty-six whales having been taken in that year. New Bedford, which now stands first in the whale-fishery, did not engage in that industry until 1760 or thereabouts.

In 1846, 722 whaling vessels, aggregating 231,406 tons, hailed from the U. S., and the catch of that year was worth $21,000,000. In 1854 the value of oil and bone had fallen to $10,766,521, and in 1880 to $2,659,725. Statistics for 1894 show that the U. S. had but eighty-five vessels engaged in whaling, and that during the year they took 272,300 lb. of whalebone, worth $803,285; 339,223 gal. of sperm oil, worth $189,965; and 273,105 gal. of whale oil, valued at $88,759; a total of $982,009. While the final decline of the whale-fishery is due to the growing scarcity of whales and the introduction of mineral oils and substitutes for whalebone, the American fishery has been particularly unfortunate in other ways. The war of the Revolution put an end to all whaling save that carried on by Nantucket, and even this was almost destroyed. Then came a revival, followed by the war of 1812, and finally during the civil war the Arctic whaling fleet was burned by the Confederate privateer Shenandoah. After all this came the loss of thirty-three out of forty vessels which were crushed by the ice in 1871.

The right whale or bowhead, *Balæna mysticetus*, is commercially the most important, on account of the whalebone, the oil being a secondary consideration, and this species is taken in the Arctic Ocean and Davis Strait, usually in the vicinity of ice. The southern right whales, *Balæna biscayensis*, *japonica*, *australis*, and *antipodarum* are taken respectively in the North Atlantic, North Pacific, and Antarctic seas, but have become scarce, and their capture forms a comparatively unimportant branch of the whale-fishery, although the pursuit of the first-named species gave rise to the whale-fishery. These species frequent the vicinity of land to bring forth their young, and this fact, coupled with regard for their offspring, has led almost to their extermination, since it was the habit of whalers, especially those of Australia and New Zealand, to kill the young and then take the mother. The finbacks, *Balænoptera*, and humpbacks, *Megaptera*, yield comparatively little oil, and their bone is almost worthless; still, in spite of their size and power, the introduction of steamers, bomb-lances, and harpoon-guns has rendered their capture practicable and profitable in many places, notably on the coast of Norway. These animals are often killed in shallow water, as in Massachusetts Bay, where they sink, but rise in a few days and are towed ashore. The sperm whale, *Physeter macrocephalus*, furnishes the best grade of oil; it is taken in the warmer parts of the Atlantic, Pacific, and Indian Oceans. The bottlenose, *Hyperoodon rostratum*, a relative of the sperm whale, furnishes a good oil, and, although of comparatively small size, is taken from steamers in the North Sea in considerable numbers.

The early harpoon was that with a V-shaped point, and the lance had a leaf-shaped point, or one much like the blade of a putty-knife. A great improvement was effected when the head of the harpoon was made with a single long barb, so pivoted to the shaft as to set at right angles to it when a strain was put upon the line attached to the harpoon. Though many patterns of harpoons have been devised, this is still the favorite for throwing by hand. Certain styles of harpoons are shot from heavy swivel-guns, mounted either on the bow of a boat or on the forward part of a steamer, and these are employed in the finback and bottlenose fisheries of the North Sea. Still other harpoons are fired on the principle of a rocket, and are so constructed that while the head fastens to the whale, a bursting charge, contained in the rear portion, explodes and kills the creature, while in another piece of apparatus thrown by hand a bomb-lance, attached to the handle, is fired as soon as the harpoon has entered a certain depth. The use of the bomb-lance has rendered the killing of whales safer and more expeditious; this "lance" consists of a hollow cylinder, 12 to 20 inches long, pointed at one end, feathered at the other to make it fly straight. The lance is filled with powder, fired from a short, heavy gun from the shoulder, and so timed as to explode in the body of the whale.

Whaling was originally carried on in boats from stations on the shore, and the whales when discovered were pursued, harpooned, and when tired out killed by means of long lances thrust by hand. Next came the employment of sloops and other small sailing craft which ventured but a short distance from shore, and these were superseded by larger vessels as the whales became scarcer, until barks and ships were the standard whalers, and a voyage lasted three years or more. The best whaling-vessels are bark-rigged auxiliary screw steamers, that is, sailing-vessels equipped with an engine of moderate power and a propeller which can be raised when the breeze is favorable.

Owing to the increasing scarceness of whales some of the British and American steam whalers have of late years wintered in Arctic seas, the former in Davis Strait, the latter at the mouth of Mackenzie river, where they awaited the coming of the whales at the breaking up of the ice in spring. These measures were successful in 1893, when 294 bowheads were taken by the U. S. Arctic fleet, one vessel, the Narwhal, capturing forty-eight whales worth $180,000. In 1894 the whaling was poor, probably as a result of the former season's catch, and it seems as if profitable whaling were drawing toward a close. It had been hoped that the Antarctic seas might contain profitable grounds, but steamers dispatched there met with small success, and it is probable that the whales once reported there were simply those which in the winter sought the vicinity of Australia and New Zealand, where they were exterminated.

See Scammon, *Marine Mammals of the Northwestern Coast of North America* (1874); Starbuck, *History of the American Whale Fishery*, in *Report* of Commissioner of Fish and Fisheries for 1875–76 (1878); *Fisheries and Fishery Industries of the United States*, sec. v., vol. ii. (1887), better known as quarto *Fishery Report*. F. A. Lucas.

Whale Oil: the liquid portion of the fat of the common whale, differing from that obtained from the *Physeter macrocephalus* (sperm oil) in possessing a darker color and more disagreeable odor. It possesses a sp. gr. of ·927, contains small quantities of spermaceti, and does not become solid above 32° F., while sperm oil has a sp. gr. of ·868, and remains semi-solid at 44·6° F. Whale oil can be deodorized by agitation with bleaching-powder.

Whang-hai: an old spelling of Hwang-hai, the Yellow Sea (*q. v.*).

Wharf and Wharfing [wharf < O. Eng. *hwerf*, a bank or dam to keep out water]: A wharf is a broad plain space or surface resting upon the shore of a harbor or a navigable stream, and generally projecting out beyond the lowest ebb of the tide, so that vessels may moor at its sides or end. Its purpose is to afford a convenient place at which vessels may load and unload—that is, on which goods may be deposited when taken out of a ship or preparatory to being put on board a ship. In the U. S. wharves are generally constructed by driving piles into the bed of the harbor or river, and covering them with a flooring of timber-work and plank; but they are sometimes built of stone upon abutments and piers. It is plain that a wharf must necessarily abut upon the space where the tide ebbs and flows, and that it may extend beyond that space. It is a settled doctrine of the common

law that this portion of land between high and low tide, called the "shore," belongs to the government, and that the harbor or river beyond the lowest ebb is under the exclusive control of the government. A wharf, therefore, built without governmental authority would be a public nuisance. In Great Britain the crown, in the U. S. the several States, hold the power to authorize and regulate the construction and use of wharves. As a matter of fact, this authority has been frequently ceded away, either to municipal corporations or to private persons. The State of New York, for example, has granted the shore of Manhattan Island to New York city, and that city owns the wharves which fringe its territory, and which it leases to individual occupants. In other States the shore and the right to construct wharves thereon have often been conveyed to the proprietors of the adjacent uplands.

WHARFING is the business carried on by the occupant of a wharf, either owner or lessee, who is termed a wharfinger. He is a bailee for hire, for he receives and keeps the goods placed in his custody. He is entitled to demand a compensation, called wharfage, for the privilege of mooring a vessel at his wharf, and there receiving or discharging her cargo, and for the storage of goods. The amount of these fees, since the business is one of a quasi-public nature, is often regulated by statute. (See, e. g., the New York Consolidation Act (Laws of 1882, chap. 410), secs. 716, 798–802.) The wharfinger is bound to exercise ordinary care and diligence in respect of the goods placed in his custody—that is, deposited on his wharf—and is responsible for losses caused by ordinary negligence. Unlike the warehouseman and most other bailees, he has a general lien on the goods of a customer for any balance due him on account. See LIEN.

Revised by GEORGE W. KIRCHWEY.

Wharncliffe, JAMES ARCHIBALD STUART-WORTLEY MACKENZIE, Baron: b. in England, Oct. 6, 1776; served in the army 1791–1801; entered Parliament 1797; was created Baron Wharncliffe July 12, 1826; was Lord Privy Seal Dec. 15, 1834, to Apr., 1835, and became president of the council 1841. D. in London, Dec. 19, 1845. He was a great-grandson of the celebrated Lady Mary Wortley Montagu, whose *Letters and Works* (5 vols., 1837) he edited. He was the originator of that standing order of the House of Lords known as the Wharncliffe order. A similar order has been adopted by the House of Commons, and the meetings held in conformity with this order have since their introduction been popularly known as "Wharncliffe meetings."

Wharton, FRANCIS, D. D., LL. D.: jurist; b. in Philadelphia, Pa., Mar. 7, 1820; graduated at Yale in 1839; studied law and was admitted to the bar in 1843; and in 1845 became assistant district attorney in Philadelphia, where he practiced for many years; in 1856 he went to Kenyon College, Ohio, as Professor of Logic and Rhetoric, and remained there until about 1863, and then went abroad; returned to the U. S. and was ordained in the Protestant Episcopal Church, and became rector of St. Paul's church, Brookline, Mass., also holding at the same time professorship of Canon Law, Polity, and Apologetics in the Divinity School at Cambridge, Mass., and of International Law in the Boston Law School; in Mar., 1885, he was appointed by the President of the U. S. counsel to the State Department at Washington, D. C., in matters of international law; and in 1888, under a resolution of Congress, was made editor of the Revolutionary diplomatic correspondence of the U. S. D. at Washington, D. C., Feb. 21, 1889. He was a man of extremely varied attainments, and remarkable rather for the breadth of his knowledge than for minute accuracy in scholarship. His best-known work is a *Treatise on the Criminal Law of the United States* (1846), which is a standard work, and has passed through many editions, besides which he also wrote many others, including *State Trials of the United States during the Administrations of Washington and Adams* (1849); *Precedents of Indictments and Pleas* (1849); *Treatise on the Law of Homicide in the United States* (1855); *Treatise on Theism and Modern Skeptical Theories* (1859); *The Silence of Scripture, a Series of Lectures* (1867); *Treatise on the Conflict of Laws, or Private International Law* (1872); *The Law of Agency and Agents* (1876); *Commentary on the Law of Evidence and Civil Issues* (1877); *Commentary on the Law of Contracts* (1882); *Commentary on Law* (1884); *Digest of the International Law of the United States* (1886); *Treatise on the Law of Evidence and Criminal Issues* (8th ed. 1880). F. S. A.

Wharton, GRACE and PHILIP: See THOMSON, KATHARINE.

Wharton, PHILIP, Duke of: politician; son of Thomas, the first marquis; b. in Dec., 1698; made a secret marriage at the age of sixteen; succeeded to the marquisate Apr., 1715; studied under a strict Calvinistic tutor at Geneva 1716, but ran away to Avignon, where he recognized the Pretender and is said to have received from him the title of Duke of Northumberland; proceeded to Paris; soon afterward took a seat in the Irish House of Peers 1716; distinguished himself in debate; was made Duke of Wharton in the English peerage Jan. 28, 1718; entered the British House of Lords 1720; distinguished himself against the ministry; soon impoverished himself by his extravagance; edited a semi-weekly paper, *The True Briton*, 1723–24; went to Vienna, and thence to Madrid, 1726; took service under the Pretender; was aide-de-camp to the Count of Torres at the siege of Gibraltar; was made colonel of an Irish regiment in the Spanish service; was attainted of treason in England, and his property was confiscated; visited Rome, Paris, and other parts of Europe, and died in poverty at Tarragona, Spain, May 31, 1731. His *Life and Writings* appeared in the following year (2 vols., 1732). His *Poems* had been published in 1727. Revised by F. M. COLBY.

Wharton, THOMAS, Marquis of: Whig statesman; b. in England about 1640; eldest son of Philip, fourth Baron Wharton; entered Parliament soon after the Restoration; took a prominent part in the opposition to Charles II.; was sent to the Tower for joining in the complaint against the long prorogation of Parliament Feb. 17, 1677; was one of the first to join the Prince of Orange 1688; was appointed comptroller of the royal household and privy councilor Feb., 1689; succeeded to the family title 1696; fought a duel with Viscount Cheyney 1697; was commissioner to negotiate the union with Scotland, for which service he was rewarded with the titles of Viscount Winchenden and Earl Wharton Dec. 23, 1706; was Lord-Lieutenant of Ireland 1708–10, with Addison for his secretary, and became Privy Seal on the accession of George I., Sept., 1714, and Marquis of Wharton and Malmesbury Feb. 15, 1715, having been a zealous Whig and supporter of the Hanoverian succession, and a skillful party manager, though notorious for licentiousness. D. in London, Apr. 12, 1715. He was the reputed author of the famous Irish ballad *Lillibullero*.

What Cheer: city; Keokuk co., Ia.; on Coal Creek, and the Burl., Cedar Rap. and N. and the Chi. and N. W. railways; 12 miles N. W. of Sigourney, the county-seat, and 70 miles S. E. of Des Moines (for location, see map of Iowa, ref. 6–I). It is in a coal-mining and agricultural region, and has 6 churches, 3 public-school buildings, a national bank with capital of $50,000, a State bank with capital of $30,000, 3 weekly newspapers, and district fair-grounds. Pop. (1880) 719; (1890) 3,246; (1900) 2,746. EDITOR OF "PATRIOT."

Whatcom, New—name changed to Whatcom in 1901: city; capital of Whatcom co., Wash.; on Bellingham Bay, and the Bell. Bay and Brit. Col., the Gr. North., and the N. Pac. railways; 125 miles N. of Seattle (for location, see map of Washington, ref. 1–C). It is in an agricultural, lumber, and mineral region, and has large commercial interests that are promoted by exceptional facilities for transportation by rail and water. The harbor is nearly landlocked, about 7 miles in diameter, and with 5 to 13 fathoms of water. A State road is being constructed from the city over the Cascade Mountains, across the celebrated Mt. Baker pass, to the gold and silver mines, the grazing-lands, and the Columbia river. The city contains a State normal school, and has a court-house built of native stone, new city-hall, gravity waterworks supplied from Lake Whatcom, 4 miles distant, the noted Cornwall coal mine, improved sewerage, electric-lighting and street-railway plants, 2 national banks with combined capital of $110,000, a private bank, and a daily, a tri-weekly, and 2 weekly newspapers. The former city of Whatcom and the town of Sehome were consolidated under the name of New Whatcom in Dec., 1890. Pop. (1880) not in census; (1890) Whatcom, 4,059; (1900) 6,834; Sehome, 2,700 —total, 6,759. Commercial Club census immediately afterward gave 9,135. EDITOR OF "REVEILLE."

Whately, RICHARD, D. D.: Archbishop of Dublin; b. in London, England, Feb. 1, 1787; studied at Oriel College, Oxford; took a double second-class in honors 1808; became a fellow of Oriel 1811; took orders in the Church of England; was intimately associated at Oriel with Keble, Arnold, Pusey, John Henry Newman, and others destined to become innovators in British theology; was noted for his wit, his freedom of thought and action, and fondness for

debate; was Bampton lecturer 1822; rector of Halesworth, Sussex, 1822–25: principal of St. Albans Hall, Oxford, 1825–30; Professor of Political Economy in the University of Oxford 1830–31, and was appointed by Earl Grey Archbishop of Dublin 1831, in which capacity he was charged with the difficult task of carrying out, in the details of social, political, and religious life, the principles embodied in the Roman Catholic Relief Act. He was for twenty years the leading member of the Irish national board of education, for which he wrote several educational books; endowed the professorship of political economy in the University of Dublin; promoted the extension of the "national system" of unsectarian education in Ireland; won the confidence and co-operation of the Roman Catholic Archbishop Murray, but resigned his seat at the board in 1853 from inability to work in harmony with Archbishop (afterward cardinal) Cullen, and from the covert opposition of illiberal clergymen of the Church of England. He filled the posts of Bishop of Kildare, visitor of Trinity College, president of the Royal Irish Academy, and chancellor of the order of St. Patrick. Archbishop Whately was regarded as one of the founders of the "Broad Church" party, and was distinguished for "large munificence, genial hospitality, ever-ready wit, and solid common sense." D. in Dublin, Oct. 8, 1863. Among his numerous works are *The Use and Abuse of Party Feeling in Matters of Religion* (Oxford, 1822), being the Bampton lectures for that year; *Essays on some of the Peculiarities of the Christian Religion* (1825); *Elements of Logic* (1826); *Elements of Rhetoric* (1828); *Essays on some of the Difficulties in the Writings of the Apostle Paul, and in other Parts of the New Testament* (1828); *View of the Scripture Revelations concerning a Future State* (1829); *Introductory Lectures on Political Economy* (1831); *Essay on the Omission of Creeds, Liturgies, and Codes of Ecclesiastical Canons in the New Testament* (1831); *The Kingdom of Christ delineated* (1841); *Introductory Lessons on Christian Evidences* (1841); *Introductory Lessons on the Study of St. Paul's Epistles* (1849); *English Synonyms* (1851); *Cautions for the Times* (1853); *Bacon's Essays, with Annotations* (1856); *Introductory Lessons on Morals* (new ed. 1860); *Introductory Lessons on Mind* (1859); *Introductory Lessons on the British Constitution* (1859); *Lectures on some of the Parables* (1859); *Lectures on Prayer* (1860); *A General View of the Rise, Progress, and Corruptions of Christianity* (1860); and *Miscellaneous Lectures and Reviews* (1861). His daughter, Miss E. Jane Whately, edited his *Miscellaneous Remains* (1864) and *Earlier Remains* (1864); and also published her father's *Life and Correspondence* (2 vols., 1866). Two volumes of *Memoirs* (1864) were published by William J. Fitzpatrick.

Revised by J. M. Baldwin.

Wheat [M. Eng. *whete* < O. Eng. *hwēte*: O. H. Germ. *weizzi* (> Mod. Germ. *weizen*): Icel. *hveiti*: Goth. *hwaiteis*: Lith. *kwetỹs*, wheat; cf. *white*]: one of the most valuable of the cereals, the *Triticum sativum* (Lam.) of the family *Gramineæ*; distinguished by a spike bearing spikelets on opposite sides of a hollow and jointed stem which rises zigzag, and forms notches at each joint. The kernels have a longitudinal furrow on one side, and are inclosed by glumes or chaff which frequently bear awns. The plant is not now known in a wild state, but many botanists believe that it had its home in the western part of Asia. The cultivation of wheat is as old as the history of man. Chinese records mention it at a date earlier than 2000 B. C. It is not known to have grown in America until after the discovery of that continent by Columbus. Two forms of wheat are cultivated for food: one in which the glumes are easily removed by the ordinary methods of threshing, the other, in which they adhere firmly to the kernel like barley, and is known as spelt. The former includes by far the greater part of the world's crop. Spelt is chiefly grown in the mountainous districts of Europe. The varieties of wheat are classified by agriculturists as spring and winter, bearded and beardless, and also according to the color of the grain, as red, amber, white, etc. Spring wheat is grown mostly in the colder latitudes, the seed being sown early in the spring, sometimes even before the frost is out of the ground. The grain ripens and is harvested the same season the seed is sown. Winter wheat is sown in the autumn, the grain maturing the following summer. This kind of wheat is grown mostly in latitudes where the rigor of winter is less severe than in the spring wheat districts. The terms *bearded* and *beardless* are used merely to indicate whether the glumes bear awns or not. The color of the kernel gives little indication of productiveness or quality. The red varieties, as a rule, are more hardy than the lighter-colored grains.

Climate and Cultivation.—The quality of the grain is influenced by climate and soil, the principal change being in the proportion of gluten; the greater proportion of gluten the more valuable the grain for food. The varieties producing the hardest kernels are most prized for flouring purposes. Soil, climate, and cultivation also have a great influence on the character of the plant. It is clearly shown that by means of these winter wheat can be changed to spring wheat and *vice versa*, white to red, and the character of the awns also greatly changed. For the best results it is necessary that the wheat plant be given a chance to make its growth during cool weather, either in the early spring or late autumn in order to induce tillering. Under these conditions a much greater yield is secured than when the whole growth is made during warm weather. It is an exacting plant, and requires, thorough preparation. The best prepared soil is thoroughly compacted below, and finely pulverized at the surface. Whenever winter wheat follows a crop of spring grain, it is best to plow as early as possible after the spring crop is harvested, that plant food in the soil may be liberated by cultivation, and the soil compacted before the wheat is sown. The time of sowing will vary with different localities, the farther N. the earlier, and later the farther S. The best results are obtained by sowing with a grain-drill. Varieties that tiller well do not require so much seed. The size of the kernels and time of seeding governs to quite an extent the amount of seed sown, late seeding requiring more seed. As a rule, from 1 to 2 bush. an acre are usually sown. As wheat is usually harvested, it yields about two and a half times as much straw and chaff as grain. The greater the yield of grain to the acre, the greater the proportion of grain compared to the chaff and straw.

Composition and Fertilizers.—The cultivation of wheat is best suited to mixed husbandry, or where it can be grown in a rotation with other crops. Continued cultivation, by ordinary methods, without manure, so exhausts the land that the crop becomes unprofitable. In some of the Western States of the U. S. large areas formerly given wholly to the cultivation of wheat are now used for other purposes on account of the exhaustion of the soil for this crop. Wheat removes from the soil a much larger amount of nitrogen than of either phosphoric acid or potash. The following table gives the percentage of the principal elements of plant food removed from the soil by wheat and its products. These percentages are the average of a large number of American analyses of wheat:

	Moisture.	Ash.	Nitrogen.	Phosphoric acid.	Potash.
Wheat (spring)	14·35	1·57	2·36	0·70	0·39
Wheat (winter)	14·75	....	2·3[illegible]	0·89	0·61
Wheat straw	12·56	3·81	0·59	0·12	0·51
Wheat chaff	8·05	7·18	0·79	0·70	0·42
Wheat bran	11·74	6·25	2·67	2·89	1·61
Wheat flour	9·83	1·22	2·21	0·57	0·54
Wheat middlings	9·18	2·30	2·63	0·95	0·63

FODDER ANALYSES OF WHEAT AND ITS PRODUCTS GIVEN IN PER CENT.

	Protein.	Crude fiber.	Nitrogen, free extract.	Fat.
Wheat (spring)	12·5	1·8	71·2	2·2
Wheat (winter)	11·8	1·8	72·0	2·1
Wheat flour	10·8	0·2	75·0	1·1
Wheat bran	15·4	9·0	53·9	4·0
Wheat straw	3·4	38·1	43·4	1·3

Harvesting and Threshing.—Modern inventors have wrought great changes in the manner of harvesting. In the great wheat districts of America the grain is now wholly harvested by power machines, horses being generally used. On smaller farms the twine-binder is used, which cuts and binds the grain into bundles by means of horse-power. On more extended farms or ranches machines called headers are used, which gather the heads of grain with as little straw as possible. These machines are also constructed for threshing the grain as fast as it is cut, leaving sacks filled with wheat scattered over the field. See Reaping and Mowing Machines.

Diseases.—Several fungus diseases attack this crop with more or less severity. Among the most disastrous are rusts,

one of which, caused by the fungus *Puccinia graminis*, is the most prevalent. (See RUSTS.) Beardless and white varieties are more liable to be attacked than the bearded and red varieties. Hot, wet weather just before the wheat ripens is favorable to the growth of these fungus parasites. Early ripening varieties are more likely to escape than those which ripen later. All forms of rust attack the wheat after germination, and are not caused by the seed being contaminated. Other forms of fungus cause diseases known as smut. See SMUTS.

Insect Enemies.—One of the greatest enemies to the wheat plant in the U. S. is the Hessian fly (*Cecidomyia destructor*), a small two-winged gnat somewhat resembling a mosquito. It produces two or three broods, the fly laying its eggs in the autumn between the leaf and the main stalk. The young passes the winter in this position in pupa form, known as the flaxseed stage, which seed it very much resembles. In the spring the adult emerges and lays eggs between the leaf and stalk farther from the ground. The stalks are weakened and produce a poor quality of grain, many stalks breaking over and remaining ungathered by the reaper. Late seeding is practiced to prevent or diminish its ravages. Chinch bug (*Blissus leucopterus*) has done great injuries in the States drained by the Mississippi river. It is a small insect, not more than one-sixth of an inch in length. The eggs are deposited beneath the ground, the young feed on the roots, then the leaves. Their numbers are often so great that whole crops are entirely destroyed. The most effective means of combating them has been by spreading a contagious disease among them by means of infected bugs. Spraying the fields with insecticides and burning the stubble are recommended. Wheat midge (*Diplosis tritici*), a small gnat, deposits its eggs in the wheat blossoms. The young feeding on the undeveloped grain cause it to shrivel, and thus produce a worthless or inferior quality of berry. No remedy is known. Some varieties of wheat are less likely to be attacked than others. Varieties known as bearded and long berry red are most likely to escape ravages. White grubs, the larva of the genus *Lachnosterna* (May beetles), frequently do considerable damage to young wheat in the fall by feeding upon the roots. Skunks and crows often come to the relief of the farmer at this time, and destroy large numbers of these insects. Wire worms, the larval form of click beetles or elaters, feed on the roots of wheat and frequently do considerable damage. No satisfactory remedy has been found, although thorough tillage and compacting the soil has proved beneficial.

Production.—The annual estimate of the Hungarian Government of the world's production in 1895 was as follows in bushels:

IMPORTING COUNTRIES.		EXPORTING COUNTRIES.	
France	301,573,000	Russia	415,053,000
Italy	114,898,000	United States	400,017,000
Germany	103,550,000	India	237,456,000
Spain	86,528,000	Hungary	150,361,000
Great Britain	46,811,000	Asia, excluding Turkey	70,950,000
Austria	45,392,000	Roumania	62,414,000
Belgium	21,277,000	Argentina	60,995,000
Portugal	7,376,000	Bulgaria	52,482,000
Switzerland	5,390,000	Canada	51,066,000
Denmark	5,106,000	Africa	47,094,000
Scandinavia	5,106,000	Turkey	42,555,000
Netherlands	3,404,000	Australia	35,746,000
Greece	3,120,000	Servia	8,511,000
Total	749,531,000		
Grand total	2,402,671,000	Total	1,653,140,000

In the U. S. the average production in 1880–89 was 449,695,359 bush., and in 1890–1900, 504,818,969 bush. The largest annual production was in 1898, 675,148,705 bush. In 1900 the production was 522,229,505 bush., valued at $323,515,177, from 42,495,385 acres. The following States yielded a product of 5,000,000 bush. and upward each:

Kansas	82,488,655	Maryland	15,187,848
Minnesota	51,509,252	North Dakota	13,176,213
California	28,543,628	Wisconsin	13,166,599
Washington	25,096,661	Kentucky	12,442,846
Nebraska	24,801,900	Tennessee	11,696,088
Texas	23,395,913	Virginia	9,421,932
Iowa	21,798,223	Michigan	9,271,764
Pennsylvania	20,281,334	Ohio	8,523,876
South Dakota	20,149,684	Colorado	7,207,117
Missouri	18,846,713	New York	6,496,166
Oklahoma	18,657,373	Indiana	6,411,702
Illinois	17,982,068	North Carolina	5,960,803
Oregon	16,198,012	Georgia	5,011,133

GEORGE C. WATSON.

Wheatear, or **Fallowchat**: the *Saxicola œnanthe*, a European bird of the family *Turdidæ*, allied to the CHAT (*q. v.*), ranges from Africa in winter to the North of Europe in summer, is 6½ inches in length, generally colored ash-brown and buff, marked with white and black, and is easily trapped as a delicacy for the table. It feeds on worms and insects, and the male sings well in confinement. F. A. L.

Wheatley, HENRY BENJAMIN: philologist and bibliographer; b. at Chelsea, England, May 2, 1838; clerk to the Royal Society 1861–79; aided in founding the Early English Text Society and was its honorary secretary until 1872; became assistant secretary to the Society of Arts 1879; is secretary of the Topographical Society of London and of the Index Society; edited for the Text Society, from the original MS., Alexander Hume's quaint treatise. *Of the Orthographie and Congruitie of the Britan Tongue* (1865); *Merlin, or The Early History of King Arthur, a Prose Romance* (part i., 1866); and Peter Levins's *Manipulus Vocabulorum, a Rhyming Dictionary* (1868); compiled a *General Index to the Works of Thomas de Quincey* (1863); is author of a curious essay entitled *Of Anagrams* (Hertford, 1862); and of *Round About Piccadilly and Pall Mall* (1870); *What is an Index?* (1878); *Samuel Pepys and the World he lived in* (1880); *Bookbinding* (1882); *Decorative Art* (1884); *How to Form a Library* (1886); *How to Catalogue a Library* (1887); *Literary Blunders* (1893); and other works; edited Wraxall's *Historical and Posthumous Memoirs* (5 vols., 1884); and from the original MS. *Pepys' Diary* (1894).

Revised by HENRY A. BEERS.

Wheatley, PHILLIS: See PETERS, PHILLIS.

Wheat Midge: See WHEAT (*Insect Enemies*).

Wheat-moths: several lepidopterous insects which devour grain in the bin. Of these the best known is *Tinea granella*, an insect closely allied to the ordinary clothes-moth. Its larva devours the flour out of the kernels of wheat, and covers the shells with its thick web. Thorough cleanliness, whitewashing, and the use of coal oil tend to prevent its ravages, and the grain should be frequently shoveled over. An open lamp will also allure many of the flying moths to their own destruction. The Angoumois grain-moth (*Gelechia cerealella*) is another similar insect of the same family.

Wheaton: city; capital of Du Page co., Ill.; on the Chi. and N. W. Railway; 25 miles W. of Chicago (for location, see map of Illinois, ref. 2-G). It is in an agricultural, dairying, and stock-raising region, and has 8 churches, 2 public schools, new water-works plant (cost $60,000), public library presented to the city by J. Q. Adams (cost $50,000), a private bank, and 4 weekly newspapers. It is the seat of Wheaton College (Congregational, founded as Illinois Institute in 1853, chartered under its present name in 1860), which in 1894 had 16 professors and instructors, 287 students, $50,000 in productive funds, and $15,000 in total income. Pop. (1880) 1,160; (1890) 1,622; (1900) 2,345.

EDITOR OF "WHEATON ILLINOIAN."

Wheaton, FRANK: soldier; b. in Providence, R. I., May 8, 1833; educated as a civil engineer at Brown University; employed as assistant on the U. S. and Mexican boundary survey and Government surveys 1850–55, when he became first lieutenant in the First U. S. Cavalry; became lieutenant-colonel of volunteers July 10, 1861; was promoted brigadier-general of volunteers from Nov. 29, 1862, and commanded a brigade Sixth Corps at the storming of Marye Heights and battle of Salem Heights, May 3–4, 1863; in command of a division at battle of Gettysburg; detached from the Army of the Potomac Dec. 30, 1863, to defense of Harper's Ferry; rejoined that army Mar., 1864, and in command of brigade Sixth Corps from Wilderness battles to front of Petersburg; detached with his corps to defense of Washington July, 1864, participating in the Shenandoah campaign, and in command of a division from Sept. 20 to close of the war; was breveted from lieutenant-colonel to major-general for gallantry in battle; mustered out of volunteer service Apr. 30, 1866; appointed major Second Cavalry Nov. 5, 1863, and after promotion through the regular grades became a major-general in Apr., 1897; retired May 8, 1899.

Wheaton, HENRY, LL. D.: jurist and author; b. at Providence, R. I., Nov. 27, 1785; graduated at Rhode Island College (now Brown University) 1802; studied law; was admitted to the bar 1805; spent eighteen months at the law school at Poitiers, France, 1805–06; studied some months in London 1807; practiced law at Providence 1807–12; settled in New York in 1812; edited the *National Advocate*, the organ of the administration party, 1812–15, in which he

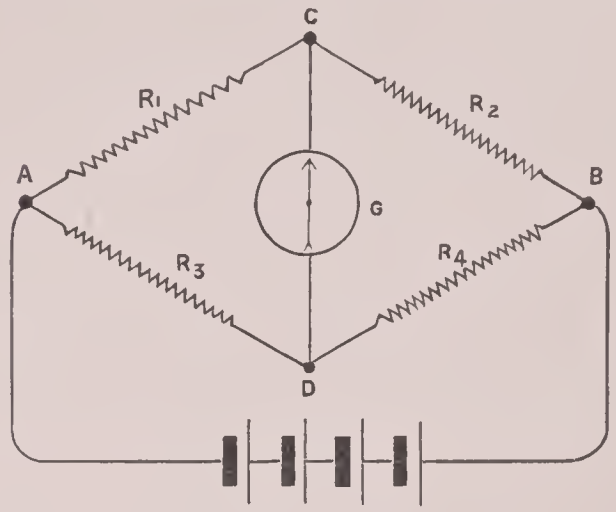
published some notable articles on the question of neutral rights in connection with the existing war with Great Britain; became division judge-advocate of the army Oct. 26, 1814; was justice of the marine court of the city of New York May, 1815–July, 1819; reporter of the Supreme Court of the U. S. 1816–27; delegate to the convention for forming a new constitution for New York 1821; member of the New York Assembly 1823; was associated with Benjamin F. Butler and John Duer in a commission for revising the statute law of New York 1825; was U. S. *chargé d'affaires* to Denmark 1825–37; displayed great diplomatic skill in the settlement of the vexed question of the Sound dues; was appointed minister resident at the court of Prussia 1835, and was soon (1837) made minister plenipotentiary, filling that post until 1846, during which period he exercised a general superintendence over the relations of the U. S. with European continental governments, and became distinguished by his writings on international law, and by his settlement of the questions relating to the Scheldt dues, the tolls on the Elbe, and the rights of naturalized citizens of the U. S.; was chosen a corresponding member of the French Institute 1843, and a foreign member of the Royal Academy of Science at Berlin 1846; signed an important treaty with Germany (1844), which was rejected by the U. S. Senate for political reasons, but has served as the basis of later treaties, and was requested to resign in 1846 by President Polk, much to the "astonishment and indignation of both parties at home and all parties abroad"; was complimented with public dinners in New York and Philadelphia on his return to the U. S. 1847, and was immediately chosen lecturer on International Law at Harvard University. D. at Roxbury, Mass., Mar. 11, 1848. He was the author of *A Digest of the Law of Maritime Captures and Prizes* (1815); *Reports of Cases Argued and Adjudged in the Supreme Court of the United States 1816–27* (New York and Philadelphia, 12 vols., 1826–27); *A Digest of the Decisions of the Supreme Court of the United States from its Establishment in 1789 to 1820* (2 vols., 1820–29); *The Life of William Pinkney* (1826); *A History of the Northmen, or Danes and Normans, from the Earliest Times to the Conquest of England by William of Normandy* (London, 1831); *The Elements of International Law, with a Sketch of the History of the Science* (Philadelphia, 1836; London, 2 vols., 1836); *Histoire du Progrès du Droit des Gens en Europe depuis la Paix de Westphalie jusqu'au Congrès de Vienne, avec un Précis historique du Droit des Gens européen avant la Paix de Westphalie* (Leipzig, 1841), written in unsuccessful competition for a prize offered by the French Institute, and translated into English by William B. Lawrence under the title *A History of the Law of Nations in Europe and America from the Earliest Times to the Treaty of Washington* (New York, 1845); *An Inquiry into the Validity of the British Claim to a Right of Visitation and Search of American Vessels suspected to be engaged in the Slave-trade* (1842); contributed to Dr. Andrew Crichton's *History of Scandinavia* (1838); and published many articles in the *North American Review* and other periodicals, and numerous historical, political, and literary addresses or essays. His great work on *International Law* has become a recognized standard in the English language, and has been edited by rival commentators, William B. Lawrence (with a biography, 1855) and Richard H. Dana, Jr. (1866), and also in England by A. C. Boyd.

Revised by F. Sturges Allen.

Wheatstone, Sir Charles, F. R. S., LL. D.: physicist; b. at Gloucester, England, in Feb., 1802; was in early life a manufacturer of musical instruments; was led by his profession to investigate the laws of sound and their application to music—subjects on which he published several papers; became in 1834 Professor of Experimental Philosophy in King's College, London; was chosen a fellow of the Royal Society 1836; read to that body his *Contributions to the Physiology of Vision*, as a consequence of which researches he soon afterward (1838) invented the stereoscope; began in June, 1836, with William F. Cooke, a series of successful experiments in electro-magnetism, with a view to the transmission of intelligence over copper wires; took out, along with Cooke, in May, 1837, a patent for a magnetic telegraph, which was not, however, practically operated until after that of Morse; invented also an electro-magnetic alarum and various instruments for registering thermometrical and barometrical indications and transit observations in astronomy; was one of the jurors in the class for health, light, and electricity at the Paris Universal Exposition of 1855; received from Napoleon III. the decoration of the Legion of Honor; was knighted by Queen Victoria 1868; was a vice-president of the Royal Society and received its royal medal in 1840 and in 1868 its Copley medal for his researches in acoustics, optics, electricity, and magnetism; was made LL. D. by the University of Edinburgh Apr. 12, 1869, and elected foreign associate of the French Academy of Sciences June 30, 1873. D. in Paris, Oct. 19, 1875. A British official commission, consisting of Sir Mark I. Brunel and John F. Daniell, declared under date of Apr. 27, 1841, that Wheatstone was the person to whose scientific researches the practical application of the telegraph was due. His *Scientific Papers* were collected and published by the Physical Society of London in 1879.

Revised by R. A. Roberts.

Wheatstone's Bridge: an ingenious device for comparing electrical resistances. It was introduced by Sir Charles Wheatstone (*q. v.*) (*Philosophical Transactions*, 1843, ii., p. 323). A similar arrangement had been described by Christie, ten years earlier. In the diagram an electrical circuit is



Wheatstone's bridge.

divided, between A and B, into two branches: Branch $A\,C\,D$ contains two resistances, R_1 and R_2. Branch $A\,D\,B$ contains two resistances also, R_3 and R_4. Whenever C and D are at the same potential no current will flow through the galvanometer, the terminals of which connect those points. C and D will be at the same potential whenever $\frac{R_1}{R_2} = \frac{R_3}{R_4}$. When R_2 and the ratio $\frac{R_3}{R_4}$ are known, R_1 is given by the above equation. This arrangement is Wheatstone's bridge. The method of procedure consists in "balancing" the bridge by a variation of the known resistances until no current flows through the galvanometer. Its convenience, accuracy, and adaptability are such that it has become the most widely used of all methods of measuring electrical conductivity. The bridge is sometimes called Wheatstone's balance.

E. L. Nichols.

Whedon, Daniel Denison, D. D., LL. D.: educator and editor; b. at Onondaga, N. Y., Mar. 20, 1808; graduated at Hamilton College 1828; studied law; was Professor of Ancient Languages at Wesleyan University, Middletown, Conn., 1832–43; became a preacher of the Methodist Episcopal Church 1836; was Professor of Rhetoric, Logic, and History at the University of Michigan 1845–53, and became editor in 1856 of the *Methodist Quarterly Review*, which place he held until 1884, and general editor of the publications of the Methodist Book Concern, New York. He was the author of *Public Addresses, Collegiate and Popular* (Boston, 1856); *The Freedom of the Will as a Basis of Human Responsibility, etc.* (1864); and a *Commentary on the New Testament* (5 vols., 1860–75, *seq.*) of a strongly anti-Calvinistic character. He supervised also a *Commentary on the Old Testament* (7 vols., 1880–86; one volume yet to appear). D. at Atlantic Highlands, N. J., June 8, 1885.

Wheel: an instrument formerly used as a means of torture and of execution in criminal proceeding, the torture or execution being called *breaking on the wheel*. It is said to have been first used in Germany, where the criminal was laid on a cart-wheel and his extended limbs fractured with blows of an iron bar. In other countries a different form of frame was used, such as a St. Andrew's cross. Breaking on the wheel was abolished in France at the Revolution, but was used in Germany as late as 1827. It is now obsolete in all civilized countries.

F. Sturges Allen.

Wheel-and-axle: one of the so-called mechanical powers. It is an application of the principle of the lever. There are two cylinders with a common axis, with differing radii—the smaller being termed the *axle*, the larger the *wheel*. Suppose a cord is wound around the wheel in one direction, and another cord around the axle in the contrary direction. The condition of equilibrium of weights attached to these cords is that the product of each of the weights into their respective radii should be equal. See WHEELWORK.

Wheel-animalcule: See ROTIFERA.

Wheeler, BENJAMIN IDE, Ph. D., LL. D.: philologist; b. at Randolph, Mass., July 15, 1854; studied at Colby Academy, New London, N. H., and Brown University, where he graduated in 1875. He then spent four years in Germany at Berlin, Leipzig, Jena, and Heidelberg. He taught in the Providence High School, and in Brown, Harvard, and Cornell Universities. In 1886 he was given the chair of Comparative Philology in Cornell, and in 1888 his professorship was extended to include Greek. In 1895–96 he was director of the American School for Classical Studies in Athens, Greece. He was chosen in 1899 to be president of the University of California. He is author of *The Greek Noun-accent* (Strassburg, 1885); *Analogy and the Scope of its Influence in Language* (1887); *Introduction to the Study of the History of Language* (1890, joint author); and is a contributor to various magazines and journals; associate editor of *The Universal Cyclopædia* in charge of comparative philology and linguistics.

Wheeler, JOSEPH: soldier and legislator; b. at Augusta, Ga., Sept. 10, 1836; graduated at the U. S. Military Academy and appointed a brevet second lieutenant of dragoons in 1859; promoted second lieutenant Sept., 1860; resigned Apr. 22, 1861, and entered the Confederate service as lieutenant of artillery. He was rapidly promoted through the grades of colonel, brigadier, and major-general to lieutenant-general, and commanded the Cavalry Corps of the Western army from 1862 until the close of the civil war. He served with distinction at Shiloh, Corinth, Perryville, Murfreesboro, Chickamanga, and in Georgia under Johnston and Hood, and he was selected to cover the retreat of the Confederate army from Shiloh, Corinth, and Perryville. He commanded the cavalry in Bragg's Tullahoma campaign and in Longstreet's movement against and Bragg's retreat from Knoxville. He opposed Sherman's march to the sea, checking his advance at Waynesboro and Aiken. Gen. Wheeler was noted for energy and vigilance, which enabled him to make many captures of prisoners and supplies. He was wounded three times and had sixteen horses shot under him. He received the thanks of the Confederate Congress and of the State of South Carolina. From 1881 to 1899 he was a member of Congress from Alabama. In 1888 he was appointed a regent of the Smithsonian Institution. In 1898 he served in Cuba as a major-general of volunteers, and was sent to the Philippines in 1899.

Wheeler, WILLIAM ADOLPHUS: lexicographer; b. at Leicester, Mass., Nov. 14, 1833; graduated at Bowdoin College 1853; was an assistant to Dr. Joseph E. Worcester in the preparation of his quarto *Dictionary* (1856–59); contributed to the new illustrated edition of Webster's *Dictionary* (1864); published separately *A Dictionary of the Noted Names of Fiction, etc.* (Boston, 1865); edited Hole's *Brief Biographical Dictionary* (New York, 1866) and a *Dickens Dictionary* (1873); began a *Shakspearian Cyclopædia*; aided Richard Soule, Jr., in his manuals of spelling and reading; became in 1867 assistant superintendent of the Boston Public Library. D. at Roxbury, Oct. 28, 1875. He left unfinished an index to anonymous literature, entitled *Who Wrote It?* completed and edited by Charles G. Wheeler (1881), and *Familiar Allusions* (1882). Revised by H. A. BEERS.

Wheeler, WILLIAM ALMON, LL. D.: Vice-President of the U. S.; b. in Malone, Franklin co., N. Y., June 30, 1819; studied for two years at the University of Vermont; was admitted to the bar in 1845, and rose rapidly in his profession. He was for several years superintendent of schools for Franklin County. He was elected as a Whig member of the Assembly (1849–50), but joined the newly formed Republican party in 1856. He was a member of the Senate of New York in 1858 and 1859, and president *pro tem.* of that body; was a member and president of the New York constitutional convention in 1867–68; was elected a Representative in Congress to the 37th, 41st, 42d, 43d, and 44th Congresses. He was one of the organizers of the bank of Malone, and held the position of cashier and chief managing director. In the political complications which arose in Louisiana during the session of the Forty-third Congress, Mr. Wheeler was conspicuous, having been chairman of the special committee of the House of Representatives that visited Louisiana, and finally adjusted the difficulties existing there on the basis of "the Wheeler compromise." He was Vice-President of the U. S. from 1877 to 1881, after which he lived in retirement. D. at Malone, N. Y., June 4, 1887. Revised by F. M. COLBY.

Wheeling: city and port of entry, and the capital of Ohio co., W. Va.; on the Ohio river, and the Balt. and O., the Ohio River, the Pitts., Cin. and St. L., the Wheel. and Elm Gr., the Wheel. and Lake Erie, the Cleve., Lorain and Wheel., and the Wheel. Bridge and Term. railways; 63 miles W. of Pittsburg, 141 miles E. of Columbus, O. (for location, see map of West Virginia, ref. 3–G). The city is divided into eight wards, one—the seventh—being Zane's island, more than a mile long, containing 400 acres, and connected with the mainland by a suspension bridge of 1,010 feet span, and a steel bridge over which pass electric railways, running to neighboring towns in Ohio. The principal streets run parallel to the river several miles, intersected by cross streets extending back to the large hills on the E. Steamboats carry freight to all points on the Ohio and Mississippi rivers.

There are two large parks outside the city limits, two within. The most notable buildings are the city-hall and court-house, U. S. custom-house and post-office, Fourth Street M. E. church, St. Matthew's P. E. church, City Bank of Wheeling, Rogers Block, Peabody Building, National Exchange Bank, Masonic Temple, and the public schools.

Churches, Schools, and Charities.—There are about 40 churches and a Jewish synagogue. The public schools number 8, with two annex buildings, one in each ward, are modern in character and equipment, have an enrollment of 5,375 pupils, and cost annually, estimated, $100,000; 4 parochial schools have an enrollment of 2,000; and 9 academic and private schools an enrollment of nearly 400. The charitable institutions are 6, for the aged, friendless, and orphans, a Roman Catholic hospital, a Day Nursery, a Protestant hospital, and two private hospitals.

Finances and Banking.—The municipal receipts are $411,848.28; expenditures, $393,026.07; net debt, $510,232.84; and property valuation, $23,719,531. Banking facilities are supplied by 2 national banks with capital of $400,000, and 7 State and 5 savings-banks. The clearing-house has $140,000 in daily clearings.

Business Interests.—Wheeling is principally a manufacturing city. The large deposits of bituminous coal and the natural gas in the surrounding country furnish a fuel of such cheapness and facility in use as to give an exceptional advantage over many other points. There are 5 steel and iron plants with 9 blast furnaces, capacity 2,060 tons Bessemer pig daily; 4 steel-works, each having two 5-ton converters, capacity 2,100 tons daily; 1 large glass-factory; 3 potteries, annual output valued at $1,000,000; 2 steel-tube and casing works, 3 tobacco and 50 cigar factories, 4 foundries and stove-works, 1 boiler-works, 6 breweries, 4 ice plants, 4 machine-shops, brass foundry, 6 planing-mills, 5 carriage and wagon factories, 2 axle-factories, hinge-factory, 1 gun-factory. The cigar factories have a daily output of about 1,000,000. There are four daily papers, including a German publication, and a number of trade journals.

History.—The first settlement of Wheeling was made by Col. Ebenezer Zane in 1769. In consequence of Indian hostilities a stockade fort—Fort Henry—was built at Wheeling to protect the border in 1774. On Sept. 1, 1777, this fort was beset by about 300 Indians, who killed fifteen of the settlers. It sustained another attack in 1781, and again Sept. 11, 1782, was besieged by a British captain and forty regular soldiers and 260 Indians for two days, but they were repulsed by Col. Zane and his little garrison, without loss. The town was laid out by Col. Zane in 1793; was first incorporated in 1806; incorporated as a city in 1836; made the capital of the "restored government of Virginia" in 1861; was the meeting-place of the convention which formed the State of West Virginia in 1863; and was the capital of the State in 1863–70 and 1875–85. Pop. (1880) 30,757; (1890) 34,522; (1900) 38,878. Revised by B. S. HONECKER.

Wheelock, ELEAZAR, D. D.: educator; b. at Windham, Conn., Apr. 22, 1711; graduated at Yale College 1733; was ordained pastor of the Second Congregational church at Lebanon, Conn., Mar., 1735, remaining there thirty-five years; established a school 1754; had as a pupil an Indian

boy, Samson Occom (see OCCOM, SAMSON), whose proficiency led to the establishment of Moor's Indian Charity School, which grew into DARTMOUTH COLLEGE (*q. v.*), for which he obtained a large tract of land in New Hampshire and removed thither as first president of the college Aug., 1770. One of his pupils at Lebanon was the celebrated Indian chief Joseph Brant. He published several *Narratives of the Indian Charity School* (1762–75), together with an abstract of McClure and Frisbie's mission to the Delaware Indians W. of the Ohio. D at Hanover, N. H., Apr. 24, 1779. A *Memoir* by Rev. Drs. Elijah Parish and David McClure appeared in 1810. Revised by GEORGE P. FISHER.

Wheelock, JOHN, D. D., LL. D.: educator; son of Dr. Eleazar Wheelock; b. at Lebanon, Conn., Jan. 28, 1754; entered Yale College 1767; went to Hanover, N. H., with his father 1770, and graduated with the first class at Dartmouth College 1771; was tutor there 1772–74; represented Hanover in the Legislature 1775; served as major and lieutenant-colonel in the army of the Revolution, and was a member of Gen. Gates's staff; was chosen successor to his father as president of Dartmouth College 1779, though only twenty-five years of age; was given the chair of Civil and Ecclesiastical History in 1782; visited England to raise funds 1783; was partially successful, but lost the money and papers by shipwreck off Cape Cod; was removed from office 1815 in consequence of an ecclesiastical controversy, but restored 1817. D. at Hanover, Apr. 4, 1817, leaving half his estate to Princeton Seminary.

Wheelwork, or **Gearing**: a train of wheels, usually toothed, by means of which continuous rotation is communicated from one revolving axis to another. Frictional gearing, however, is that kind of wheelwork in which motion is transmitted from one wheel to another by the mere contact of the rims of the wheels. In this system it is convenient to have one of the contact surfaces (preferably that of the driver) covered by some softer material than the contact surface of the other. If the latter is of cast iron, the former will be either of wood, leather, rubber, or paper. In frictional gearing it is necessary that the smooth faces of the wheels shall be constantly pressed together. Circular V-shaped grooves and projections have been often turned upon the faces of cast-iron wheels to make the friction more effective. Teeth are generally provided, however, which, by interlocking, render the slipping of one circumference upon another impossible. Wheelwork usually receives a special designation, depending on the relative positions of the axes of the wheels. When the axes are parallel, it is called *spur-gearing*: when the axes intersect, *bevel-gearing*; and when the axes are not parallel and do not intersect, *skew-bevel* and *screw-gearing*.

One of the most important requirements in wheelwork is that smooth and continuous motion shall be communicated from the driver to the follower. In frictional gearing this always takes place, but in toothed gearing a constant ratio of the angular velocities of the two wheels in gear, without shocks, can be attained only by special forms of teeth; the investigations for the development of these forms of teeth have occupied geometricians for a long period. The forms of cross-section which have been found to produce a constant ratio of the angular motions are found generally by the rolling of curves on the pitch-circles of the wheels, tracing points in the rolling curves producing epicycloidal forms of teeth, which remain in contact with a limited amount of sliding between the curved faces of the teeth. These forms are also often involutes of the circles which form the bases of the teeth; the difference between involute teeth and epicycloidal teeth being that the curves of the former are single continuous curves forming the entire sides of the teeth, while in epicycloidal teeth the curve of a tooth is made up of two separate curves joined at the pitch-circle.

In common gearing, where great accuracy is not required, the curves of the teeth are often composed of arcs of circles drawn according to special geometric rules, these resulting curves being a sufficient approximation to the epicycloids which are traced in the more exact constructions. Instruments to facilitate this drawing of approximate profiles are called *odontographs*. The ratio of the angular velocities in spur and bevel gearing is always inversely proportional to the radii of the pitch-circles of the wheels or to the numbers of teeth in the wheels. In skew-bevel gearing this ratio is inversely proportioned to the radii at the throats or smallest parts of the hyperboloids which form the bases of the wheels; and in screw-gearing the angular velocities are inversely proportional to the number of threads. In two wheels which work continuously together during a complete revolution the pitch of the teeth (or the distance between the same points of two teeth, measured on the pitch-line) in both wheels must be the same. The pitch must also be an aliquot part of the circumference of each; hence the ratio of the numbers of revolutions in a given time must be expressible in whole numbers. To be interchangeable, epicycloidal teeth of wheels must have their profiles all drawn with the same rolling circle, and an effort has been made to fix this by agreement as the circle whose diameter is one-half the pitch-diameter of the wheel of twelve teeth in that pitch. In screw-gearing the normal pitch, i. e. the pitch as measured on a helix of the screw cylinder which cuts the teeth at right angles—must be the same in both wheels. The screw and worm wheel is an example of screw-gearing in which the axes are at right angles, the diameter of the screw being much smaller than that of the wheel.

In a train of wheelwork where spur-wheels are employed and the axes parallel, the ratio of the numbers of revolutions of the first and last wheels may be found by multiplying the numbers of teeth in all the drivers for a numerator, and of all the followers for a denominator. The resulting ratio will be that of the number of revolutions of the first wheel divided by the number of revolutions of the last wheel.

The subject of wheelwork is fully developed in Willis's *Principles of Mechanism*, in Rankine's *Machinery and Millwork*, and in other works on mechanism.

Revised by F. R. HUTTON.

Wheelwright, JOHN: clergyman; b. in Lincolnshire, England, about 1592; graduated at Cambridge, where he was a classmate of Oliver Cromwell 1614; took orders in the Church of England; was vicar of Bilsby, near Alford, 1623–31; was silenced for nonconformity by Archbishop Laud; went to Massachusetts 1636; was chosen pastor of a church at Braintree; was a brother-in-law of the celebrated Anne Hutchinson, whose religious opinions he defended; preached a sermon at Boston on Fast Day, 1637, which was declared seditious by the General Court; was banished from Massachusetts 1638; removed with his partisans to New Hampshire; founded Exeter on the Squamscott, organizing a church there, but that territory being subsequently claimed by Massachusetts, removed with a part of his church to Wells, Me., 1643; was allowed to return to Massachusetts 1646; resided at Hampton 1646–54; was in England 1657–60; was settled in 1662 as pastor at Salisbury, N. H., where he died Nov. 15, 1679. He published, in answer to Thomas Weld, *Mercurius Americanus, or Observations on a Paper entitled Of the Rise, Reign, and Ruin of the Familists, Libertines, etc., in New England* (London, 1645); and a *Vindication* (1654). See Savage's edition of Winthrop's *History*, also the volume of Wheelwright's *Writings* with memoir edited by Charles H. Bell (Boston, 1876).

Revised by GEORGE P. FISHER.

Whelan, RICHARD VINCENT, D. D.: bishop; b. at Baltimore, Md., Jan. 29, 1809; educated at Mt. St. Mary's College, Emmitsburg, Md., where he became a teacher and was "prefect of studies"; graduated in theology and philosophy at the seminary of St. Sulpice, Paris, 1831; was ordained to the priesthood at Versailles the same year; was professor at St. Mary's College 1832–35; performed mission work at Harper's Ferry, Martinsburg, and in other towns of Virginia and Maryland 1835–40; was consecrated Bishop of Richmond Mar., 1840; took the title of Bishop of Wheeling on the division of the diocese in 1851; settled at Wheeling, where he built up a seminary for young ladies and a convent at Mt. de Chantal; was a member of the Vatican Council of 1869–70, and was opposed to defining the dogma of papal infallibility, but gave in his adhesion after its promulgation. D. at Wheeling, July 7, 1874.

Revised by J. J. KEANE.

Whelk [M. Eng. *welk, wilk* < O. Eng. *wiloc, weoloc, weloc*]: a name popularly applied in a vague manner to species of gasteropod molluscs belonging principally to the families *Buccinidæ* and *Muricidæ*, but more especially to the former, the type of that family (*Buccinum undatum*) being the common whelk of England. The species of the two families agree in having shells whose body-whorls are inflated, whose spire is moderately exserted, while the aperture is notched and produced forward or canaliculated. The animals have elongated filiform tentacles; the eyes placed outside the

tentacles; the odontophore or lingual ribbon long and straight, and armed with three longitudinal rows of teeth; and the foot comparatively short. The representatives of the two families are distinguished by differences in the dentition of the odontophore. Of the species mentioned below only the last *Purpura lapillus* belongs to the *Muricidæ*. *Buccinum undatum* and some related species are very common in the colder seas, and form one of the chief elements of the food of the codfishes. In England whelks are sometimes used as an article of food, but their principal value is as bait. The shell of the almond or red whelk (*Chrysodomus antiquus*) of the market is used in the Shetland islands and some other places for a lamp, being suspended, mouth upward, by a string around the middle or toward the ends, from a nail in the wall or roof. The species of *Fulgur* and *Sycotypus* are common to the Atlantic shores of North America, and are the common large univalve shells of the coasts. *Purpura lapillus* is a very abundant species in the northern seas, and may be found in large numbers clinging to the rocks between tidemarks, as well as lower down, and especially where seaweed is abundant. It secretes a white fluid, which turns blue on exposure to the air.

Revised by E. A. Birge.

Whewell, hyū'el, William, D. D., F. R. S.: educator and author; b. in Lancaster, England, May 24, 1794; studied at Trinity College, Cambridge; graduated 1816; became a fellow there; took orders in the Church of England; was Professor of Mineralogy 1828–32, of Moral Theology or Casuistry 1838–55; was master of Trinity College from 1841, and vice-chancellor of Cambridge University from 1855 to his death, at Cambridge, Mar. 5, 1866. He long enjoyed the reputation of possessing more universal information than any other man in England. He was the author of several text-books on mathematics, mechanics, and dynamics; *Astronomy and General Physics considered with Reference to Natural Theology* (1833), being the third Bridgewater treatise; *A History of the Inductive Sciences from the Earliest to the Present Time* (3 vols., 1837; 3d ed. 1857); *The Philosophy of the Inductive Sciences* (2 vols., 1849); remodeled in 3 parts, 1858–60); *Lectures on the History of Moral Philosophy in England* (1852); *Of the Plurality of Worlds, an Essay* (1853); *Lectures on Political Economy* (1863); and *The Platonic Dialogues for English Readers* (3 vols., 1859–61), besides many minor papers. An account of his writings, with selections from his correspondence, by Isaac Todhunter, appeared in 1876, and a *Life* by Mrs. Stair Douglas in 1881.

Whey [O. Eng. *hwæg*: Dutch *wei*]: the serum of Milk (*q. v.*), obtained when the casein of milk is coagulated by means of rennet or acids, as in the manufacture of Cheese (*q. v.*). It forms a clear, straw-colored liquid, and contains the water and sugar (lactose) of the milk. The whey produced in cheese-making is usually fed to swine, although good butter can be made from it.

Whichcot, Benjamin, D. D.: clergyman; b. in Shropshire, England, Mar. 11, 1610; entered Emmanuel College, Cambridge, 1626; became a fellow there 1633; became distinguished as a tutor; took orders in the Church of England 1636; was appointed Sunday lecturer at Trinity church and preacher to the university; became incumbent of North Cadbury, Somersetshire, 1643, provost of King's College 1644, and rector of Milton, Cambridgeshire, 1649; favored the Puritans during the great rebellion and the protectorate; was deprived of his provostship at the Restoration 1661, but obtained the living of St. Anne's, Blackfriars, 1662, and the vicarage of St. Lawrence, Jewry, 1668. D. at Cambridge in May, 1683. He was regarded as "one of the heads, if not the chief founder, of the latitudinarian school of English divines," and enjoyed great fame as a preacher, and was one of the Cambridge Platonists. He published nothing, but his friend, the Earl of Shaftesbury, whose genius was kindred to his own, edited his *Observations and Apophthegms* (1688) and his *Sermons* (1698); and Dr. John Jeffery edited his *Moral and Religious Aphorisms* (repub. in enlarged ed. 1753) and his *Discourses* (3 vols., 1701–03), to which Dr. Samuel Clarke added a 4th (1707). An edition of *Sermons* (4 vols., 1751) was accompanied by a *Life* by Drs. Campbell and Gerard, who also edited the best edition of his complete works (4 vols., Aberdeen, 1751).

Whidaw-finch: See Widow-bird.

Whiff, Sail-fluke, Marysole, or **Carter**: the *Lepidorhombus megastoma*, a fish of the flatfish family (*Pleuronectidæ*), related to the turbot of the northern European coasts. The body is rather elongated, the height being contained two and two-thirds times in the total length, without including caudal; the scales are small and pectinated; the lateral line describes a semicircular curve above the pectoral; the eyes are on the left side, and close together; the teeth in a band on the jaws, and present also on the vomer, but not on the palatines; the dorsal commences on the snout in advance of the eyes; the ventrals have a long base, but are free from the anal. The whiff does not seem to be a very abundant fish anywhere, although it is "well known to the Cornish fishermen, who apply the name of 'carter' to it. It keeps on sandy ground at no great distance from land, and takes a bait, so that it is caught as often as any of the salt-water flatfishes, but is not so highly esteemed for the table, chiefly from being so thin." Its nearest representative on the American coast is the *Citharichthys microstomus* of the sandy shores of the Middle States.

Whig [clip-form of the Scottish term *whiggamore*, a horse-driver; from the so-called "whiggamore raid" in 1648]: a party designation employed in the past both in Great Britain and in the U. S. In the former country it first came into use about 1648, when it was applied to the Scotch Presbyterians who had rebelled against the crown, and it was used in 1679 in the course of the debates on the Exclusion Bill in the British Parliament as the name of the country party with the intention of stigmatizing the members of that party as rebels. From this time it was the accepted designation of the more progressive party in British politics—the party opposed to the Tories—but after the passage of the Reform Bill, in 1832, it was gradually superseded by the term Liberal. For a description of the general character of the Whig party in Great Britain, see the article Political Parties, and for some account of the part it played in history, see Great Britain (*History*).

In the American colonies of Great Britain it was applied to those who favored independence of the mother country, while supporters of the crown were called Tories; but a more important and more lasting use of the name was to designate the party that arose at the close of the so-called "era of good feeling," and was composed of those members of the Democratic-Republican party who favored a national bank, a protective tariff, a system of internal improvements, and in general held to a loose construction of the Constitution. Toward the end of J. Q. Adams's administration those who held these views assumed the name of National Republicans, as opposed to the Democratic Republicans. The former voted for Adams in the election of 1828 and the latter for Jackson. From this time the line of division is clear, and in 1834 the new party was termed Whig, implying opposition to executive encroachment, Jackson having seemed to his opponents guilty of a gross usurpation of power in the removal of the deposits from the U. S. Bank in the preceding year (Oct. 1, 1833). The Whigs agreed in little else than hostility to Jackson and the Democrats, and generally betrayed a willingness to sacrifice definiteness of purpose to numerical strength. Their programme was therefore often illogical or vague, and their presidential candidates were often men of ambiguous political principles. Not till 1840 did they win the presidency, and then by the selection of candidates of whom one held doubtful political views and the other afterward turned against the party that had elected him. The representatives of the old National Republicanism were passed by. The death of Harrison and succession of Tyler weakened the party, which was soon at variance with the executive. Nevertheless, in the campaign of 1844 the Whigs ventured to nominate Clay and adopt a definite policy, which may be summed up in the following words of the platform: "A well-regulated national currency; a tariff for revenue to defray the necessary expenses of the Government, and discriminating with special reference to the protection of the domestic labor of the country; the distribution of the proceeds from the sales of the public lands; a single term for the presidency; a reform of executive usurpations; and generally such an administration of the affairs of the country as shall impart to every branch of the public service the greatest practicable efficiency, controlled by a well-regulated and wise economy." The doubtful attitude of Clay on the question of the annexation of Texas cost his party the Southern vote without gaining for it the support of the Abolitionists, and the Whigs were defeated at the polls. As sectional interests became more potent in forming party lines, it was evident that the Northern and the Southern Whigs could not be

held together. The rupture took place on the question forced upon the country by the Wilmot proviso (see WILMOT, DAVID) to prevent the extension of slavery to States formed out of the territory acquired from Mexico. Taylor, the Whig candidate for the presidency, was elected in 1848, but soon after his accession a body of Southern Whigs withdrew and refused to act further with their party, and on the questions that arose during the year 1850 the Southern Whigs voted generally with the Democrats. At the same time the Northern Whigs were losing ground on account of their half-hearted policy on the slavery question, and were fast subdividing into factions. At last, in 1852, the Southern members of the party tried to force upon it the recognition of the compromise of 1850 as a finality. The Northern Whig leaders accepted this, but it caused such defections at the polls as to cost them the election and ruin the party as a national organization. The Southern Whigs drifted into the ranks of the DEMOCRATIC PARTY (*q. v.*), while the Northern wing was ultimately absorbed in the REPUBLICAN PARTY (*q. v.*). See also the article UNITED STATES (*History*).

F. M. COLBY.

Whimbrel [from *whimper*]: a wading bird of the genus *Numenius* (*N. phæophus*), related to the common curlew (*N. arquata*), but considerably smaller, and hence also called half-curlew and jack-curlew in England. It is found not only in Europe, but also, in the winter season of the northern hemisphere, in Africa and Asia.

Whin: See DYERS' BROOM.

Whinchat, or **Furzechat** [*whinchat* is from *whin*, furze + *chat*, a kind of bird]: the *Saxicola* (or *Pratincola*) *rubetra*, a little European bird of the family *Turdidæ*. It considerably resembles the stonechat, but is smaller, and is also considerably less than the wheatear. Like the latter, it is highly prized for the table, and is trapped in great numbers in the autumn, when fat. It is an excellent song-bird in confinement. See CHAT.

Whipping-post: a post to which a person is tied to be whipped. The phrase is used, however, to designate the institution of whipping as a means of punishment or torture, and specifically as a means of punishing for crime. As a means of torture, whipping or flogging has been in use among all nations in those stages where torture was inflicted, and consequently more or less in use also as a form of criminal punishment. Until recent years its use, practically unlimited short of death, by shipmasters at sea to enforce discipline among their crews, has been universal, but its abuse and the excessive cruelties practiced have led to its restriction or abolishment by statute in Great Britain and the U. S., as well as in some other countries. As a form of criminal punishment it was in use among the Romans, and at the common law whipping was inflicted on persons of inferior condition guilty of petty larceny or other minor offenses; but in the earliest times it appears not to have been inflicted on gentlemen. In Great Britain as well as in the U. S. whipping as a punishment for crime remained legal for some time after its general use became almost entirely obsolete. Thus in the U. S. in the early years of the nineteenth century whipping had been abolished or became disused in most of the States, except as to slaves, who were subject to it until the extinction of slavery.

In the U. S. the Constitution of the U. S., as well as the constitutions of most of the individual States, contains a clause forbidding cruel or unusual punishments, and numerous attempts have been made to establish as a legal proposition that this punishment is of such a nature as to come within this exclusion. But at the time these words, "cruel" and "unusual," were so incorporated in the Constitution of the U. S. and of the early States, the Legislatures have acted upon the assumption that whipping was not cruel or unusual within the meaning of those clauses, and the courts, both Federal and State, have held that the authors of the constitutions could not have intended to include whipping in the meaning of those terms (2 Curtis's *Reports*, 194).

At present whipping is authorized by statute in only a few of the U. S.; but its use is constantly being advocated as a punishment for certain brutal crimes, such as wife-beating, in the States where it does not exist, and is by many persons believed to be the only effectual remedy for those forms of crime. So late as the fall of 1895 a grand jury in the District of Columbia recommended that it be used in such cases.

The provisions of the various States with regard to it vary too much, and are subject to too much change to be here given in detail; but the provisions of the law of Great Britain may be given in effect, and afford a good example of the modern conservative use of this form of punishment as a preventive of crime.

The old laws of Great Britain allowed the whipping of women as well as men; but now by 1 Geo. IV., c. 57, no female may be whipped. The Criminal Law Consolidation Acts of 1861, with subsequent statutes, authorize the punishment of whipping to be inflicted upon males below sixteen years of age who have been convicted of any one of various offenses, such as malicious injury to property, larceny, embezzlement by servants or clerks, accusing of infamous crimes, etc., and except where no special provisions have been made as to the punishment of whipping, so that the common law remains in force, the court must specify the number of strokes and the instrument to be used.

In the case of an offender whose age does not exceed fourteen years, the number of strokes inflicted must not exceed twelve in number, and the instrument must be a birch rod. In the case of an offender not over sixteen years of age, the number of strokes must not exceed twenty-five, and the instrument must be a birch rod; and in the case of any other offender the number of strokes must not exceed fifty. In no case can the whipping be inflicted after the expiration of six months from the passing of the sentence. In Scotland no offender older than sixteen years of age may be whipped for theft or crimes against the person or against property.

In countries other than Great Britain and the U. S., whipping is still generally comparatively common as a form of criminal or political punishment. F. STURGES ALLEN.

Whipple, ABRAHAM: naval officer; b. at Providence, R. I., Sept. 16, 1733; in early life commanded a merchant-vessel in the West Indies trade; was captain of the privateer Game Cock during the French war 1759–60, capturing in a single cruise twenty-three French prizes: headed in June, 1772, the expedition which burned the British revenue-schooner Gaspe in Narragansett Bay; was made commodore of two armed vessels fitted out by the colony of Rhode Island June, 1775; became commander of the Columbus Dec., 1775, and afterward of the schooner Providence, which captured more British prizes than any other vessel, but was itself finally taken by the British; was placed in command of the light frigate Providence, with which he adroitly escaped from the blockade of Narragansett Bay; captured eight richly laden vessels from the Jamaica fleet 1779, and attempted with a squadron to relieve Charleston, S. C., when besieged by the British, but was captured and held a prisoner until the close of the war. He was subsequently a farmer at Cranston, R. I., until 1788, when he became connected with the Ohio Company, and settled at Marietta, O., where he died May 29, 1819.

Whipple, EDWIN PERCY: literary critic; b. at Gloucester, Mass., Mar. 8, 1819; educated in the public schools of Salem; was for some time a clerk in a bank at Salem; entered a Boston banking-house 1837; and was superintendent of the reading-room of the Merchants' Exchange from its foundation in 1837 until 1860, from which time he devoted himself exclusively to literature. He became a frequent contributor to the principal reviews and magazines, and a popular lecturer before lyceums and collegiate literary societies. He published *Essays and Reviews* (2 vols., New York, 1848–49); *Lectures on Subjects connected with Literature and Life* (1849); *Character and Characteristic Men* (1867); *The Literature of the Age of Elizabeth* (1869); *Success and its Conditions* (1871). A complete edition of his works appeared in 6 vols. (1871). D. in Boston, June 16, 1886. *Recollections of Eminent Men* (1887), *American Literature and other Papers* (1887), and *Outlooks on Society, Literature, and Politics* (1888) were published posthumously.

Revised by H. A. BEERS.

Whipple, HENRY BENJAMIN, D. D., LL. D.: bishop; b. at Adams, Jefferson co., N. Y., Feb. 15, 1822; prepared for college, but, owing to ill health, went into business; in 1847 became a candidate for holy orders, and pursued theological studies privately; was ordained deacon 1849, in Trinity church, Geneva, N. Y., by Bishop de Lancey; took charge of Zion church, Rome, N. Y., Dec. 1, 1849; was ordained priest July 16, 1850, in Sackett's Harbor by Bishop de Lancey; became rector of the Church of the Holy Communion, Chicago, Easter, 1857; was chosen Bishop of Minnesota June 30, 1859; and was consecrated in St. James's church, Richmond, Va., Oct. 13, 1859. In 1860 Bishop Whipple, with

others, organized the Bishop Seabury Mission, out of which has grown the Cathedral of Our Merciful Saviour, the Seabury Divinity School, Shattuck School, and St. Mary's Hall, which have made Faribault one of the educational centers of the Northwest. The bishop is known as the "apostle" of the North American Indians, among whom he has planted successful missions. In 1888, as the senior bishop present of the American Church at the third Lambeth Conference, he received from the University of Cambridge the degree of LL. D. He has published a number of occasional sermons and addresses, and several of his discourses have appeared in volume form. Revised by W. S. PERRY.

Whipple, SQUIRE: civil engineer; b. at Hardwick, Mass., Mar. 24, 1804; graduated at Union College 1830; was engaged in the surveying of several canal and railway routes. In 1840 he patented an iron bridge truss of the bowstring type, of which several were built over the Erie Canal. In 1847 he issued a small theoretical and practical work on bridge-building, which contained the first exact analysis of stresses in trusses and of the principles of economic design, published in the U. S. Soon after 1852 he erected several bridges of the "Whipple trapezoidal type," a form which subsequently was extensively adopted. He also patented a lift drawbridge. He was the author of *The Way to Happiness* (Utica, 1847); *A Work on Bridge-building* (1847; enlarged ed. 1869); and *The Doctrine of Central Forces* (1866). He was made an honorary member of the American Society of Civil Engineers in 1868. D. at Albany, N. Y., Mar. 15, 1888. MANSFIELD MERRIMAN.

Whipple, WILLIAM: signer of the Declaration of Independence; b. at Kittery, Me., Jan. 14, 1730; was in early life a sea-captain in the West India trade; subsequently a merchant at Portsmouth, N. H., where he acquired a considerable fortune; was a member of the provincial congress 1775, of the Continental Congress 1776; signed the Declaration of Independence; was brigadier-general of New Hampshire troops at Saratoga 1777; co-operated with Sullivan at the siege of Newport 1778; and was a member of Congress 1778–79, financial receiver of the State of New Hampshire 1782–84, and judge of the superior court from 1782 to his death, at Portsmouth, Nov. 28, 1785.

Whip-poor-will [named in imitation of its cry]: the common designation in the U. S. of species of birds of the genus *Antrostomus* of the family *Caprimulgidæ*. These are characterized by the bill being very small; the nostrils shortly tubular; the gape furnished with long, stiff, and sometimes pectinated bristles, which project beyond the end of the bill; the wings broad, rounded, and with the first quill shorter than the third; the tail broad and rounded; and the tarsi moderate and partly feathered above. The chief distinctive characters, in contrast with the night-hawks, are found in the bristled gape and the form of the tail, and in this respect, as well as others, the species agree with those of the genus *Caprimulgus*, or the typical goat-suckers of the Old World, to which they are, indeed, very closely related. "The common species, and presumably the others, are nocturnal in their habits, remaining silent and keeping within the shady recesses of the forests during the daytime. As soon as the sun has disappeared and the night-insects are in motion" they leave their retreats for exercise and in search of food. In the early part of the evening, and then for only a brief period, they emit their peculiar cry, the notes repeated with great rapidity, but with clearness and power, six or seven times in as many seconds. They are to be heard chiefly in clear weather. In the daytime their haunts are deep ravines, shady swamps, and extensive pine-groves. They lay their eggs upon the ground, generally among fallen leaves, and make no regular nest. Their eggs are two in number, and are white and somewhat spotted. Revised by F. A. LUCAS.

Whirlwind: air in spiral inflowing motion, the analogue of a whirlpool in water. Whirling motions are common to all fluids, and are the rule in the atmosphere. When the conditions causing the whirling motion are symmetrical, a complete whirl results, and is called a whirlwind. This may be of any size, from the eddy at a street corner or the whirlwind over a dusty road on a hot afternoon to a hurricane a thousand miles in diameter. In the former case the observer can see the entire whirl, in the latter he sees but a small part, and the wind at the point of observation is so slightly curved that it seems to be straight-lined. The rotation of the earth gives a uniform direction to all whirls large enough to make its twist effective—from right to left in the northern hemisphere and opposite to this in the southern. See METEOROLOGY, CYCLONES, HURRICANES, and WINDS. M. W. H.

Whisky, or **Whiskey** [from Irish-Gaelic *uisge*, water, as clip-form of the compound word *uisgebeatha* (whence Eng. usquebaugh), literally, water of life, *eau de vie*]: the spirituous liquor obtained by distilling fermented infusions of barley, rye, wheat, corn, oats, etc. According to some authorities, the art of distillation was first introduced in England in the reign of Henry II., but it is more probable that it was known and practiced in Ireland previous to this date. Directions for preparing *uisge-beatha* or *aqua vitæ* are contained in the *Red Book of Ossory*, compiled over 500 years ago, at which time it was chiefly used as a medicine, being considered a panacea for all diseases. Spirits that contain over 60 per cent. of alcohol are termed "high-wines" or common spirits; those containing 90 per cent. of alcohol are known as "cologne spirits," the name whisky being usually given to the product of a former distillation containing about 50 per cent. by weight of alcohol. In Great Britain the largest amount of whisky is made in Scotland; large amounts are made in Ireland, chiefly in Dublin; in the U. S. the principal supply comes from Kentucky (termed Bourbon whisky, from Bourbon co., Ky.), Pennsylvania (Monongahela County), Ohio, Illinois, Indiana, and Maryland; large quantities of whisky are also made in Canada. The grains used vary greatly in composition. In Scotland and Ireland malted barley is extensively employed, but a mixture of malted barley with raw grains (oats, etc.) is also very largely used. In the preparation of Bourbon whisky a mixture of 50 to 60 per cent. of Indian corn with 40 to 50 per cent. of small grain (containing about 10 per cent. malt, the balance being rye) is taken; for Monongahela whisky only rye is used, it being mixed with 10 per cent. of malt; while in Canada a mixture of rye, wheat, or corn with 5 per cent. of malted barley is chiefly employed. The quantity of alcohol afforded by the different grains is influenced by the proportion of starch, including the small amount of sugar, they contain; 2 lb. of starch will give a quart of spirit containing 30 per cent. of alcohol, or 100 lb. of starch will give 35 lb. of alcohol, equal to 4·375 imperial gal. One hundred pounds of the following grains afford the following quantities of a spirit containing 45 per cent. of alcohol: Wheat, 40 to 45 lb.; rye, 36 to 42 lb.; barley, 40 lb.; oats, 36 lb.; buckwheat, 40 lb.; maize, 40 lb. In the manufacture of whisky the starch of the grain is first changed into dextrin and glucose in the process of *mashing*, chiefly by the action of the *diastase* (a peculiar nitrogenous substance formed by the germination of the grain), which, although it exists in malt only in the very small proportion of 0·003 per cent., must be present in order that the conversion shall take place rapidly. Yeast is next added to the saccharine liquid to induce fermentation, by which the sugar is converted into alcohol and carbon dioxide; and the alcohol is finally concentrated by distillation. The essential features of the process of whisky-making are therefore the preparation of the vinous mash and the distillation of the alcohol.

Preparation of the Mash.—A quantity of water of a temperature of 150° F. is first run into the mash-tub, which is best made of circular cast-iron plates, and then the ground mixture of malt and grain is added, and the whole is thoroughly mixed. The malt used should be lightly kiln-dried by the heat of steam to avoid imparting an empyreumatic smell to the product, although this flavor is agreeable to some persons, and was formerly purposely given to whisky (notably to the famous "poteen whisky" of Ireland) by drying the malt by means of burning turf. During the process of mashing, the liquid gradually acquires a sweet taste and a greater specific gravity. When it has attained its maximum density it is drawn off, and more water, of a temperature of 190° F., added to the residual grain and allowed to infuse with it for one to two hours. This second wort is added to the first, and a third quantity of boiling water poured over the remaining mixture, which is afterward used for the first liquor in the mashing of fresh meal and malt. In beer-making (see BEER) the brewer does not require complete saccharification, some dextrin being necessary; but the distiller desires to obtain the greatest amount of sugar possible. The mash is next cooled down to the proper temperature for fermentation (70° F.) by passing it through a series of pipes surrounded by cold water, and it is then introduced into the fermentation-vat. Formerly 4 per cent. of yeast was added to the wort, but at

present not over 1 to 1½ per cent. is used, three-fourths of which is added directly, the remainder only after the second day of the process. As fermentation advances the temperature of the wort increases about 20° F., but it should not be allowed to attain to over 95° F., in order to avoid acetification, which can be detected by an increased density of the wort and by the odor of acetic acid. The time occupied in the process of fermentation varies from three to nine days. Owing to the disappearance of the sugar and the formation of carbon dioxide and alcohol, the specific gravity of the liquid decreases, the operation being considered finished when the greatest degree of attenuation has been reached. Distillers strive to reduce the density of the wort to that of water, but even then a considerable quantity of sugar remains undecomposed, sometimes amounting to one-fifth of the entire saccharine matter. This difficulty is due to the fact that the alcohol first formed tends to prevent the further decomposition of the remaining wort into sugar, and can be remedied by removing the alcohol as soon as it is produced by diminishing the pressure in the fermentation-vat with an air-pump, which enables the alcohol to be distilled off at 125° F. When, instead of a mixture of raw grain and malt, only the latter is taken, the process employed is slightly different. Five hundred bushels of the ground malt are first mashed with 9,000 gal. of water having a temperature of 160° F., and as soon as saccharification has taken place, 6,000 gal. of the wort are drawn off and cooled to 60° F., after which it is run into the fermentation-vat and a mixture of London-porter yeast and quick Scotch barm added. The fermentation is usually completed at the end of two or three days, when 1 lb. of soap is added for every 100 gal. of the mash, and the mixture introduced into the still. In malt-whisky distilleries 1 bush. of malt should yield 2 to 2½ gal. of proof spirits. In localities where potatoes abound, this root is occasionally employed for the preparation of a vinous mash. The dry substances of potatoes constitute about 28 per cent., three-fourths of which is starch. The conversion of this starch into glucose can be effected either by the action of malt or by that of dilute sulphuric acid. In the former case the potatoes, after cleansing, are cut into small pieces and thoroughly incorporated with boiling water, malt (generally a mixture of malted rye and barley) then being added, and the process of mashing and cooling conducted as described above. The proportion of malt used is variable, but 5 per cent. is the average amount employed. In the preparation of the mash by the use of sulphuric acid, the raw potatoes are first converted into a pulp, which is thrown into a large vat containing water. When the starch has settled to the bottom of the vessel the supernatant liquid, which contains the albumen of the potatoes, is removed by means of a siphon, and the residue transformed into glucose by boiling with a very diluted sulphuric acid for about five hours, the point of complete conversion of the starch being ascertained by the iodine test. The fluid is next run through a wooden strainer, in order to remove the cellular tissue present, and the free acid is neutralized by the addition of chalk. The precipitated gypsum is then allowed to settle, the clear liquid being now ready for the fermentation-vat. The fermentation of potato-mash is carried on in a manner similar to that employed with malt, 4 per cent. of yeast being added, and from sixty to seventy hours required for the operation. One hundred pounds of potatoes afford about 16 lb. by measure of proof spirits. In Germany and Holland, where the sugar-beet is extensively cultivated, the poorer grades of a crop are often converted into spirits by fermentation and distillation, the process of mashing being omitted, as the sugar exists ready formed in the beet-root. Spirits can also be obtained from horse-chestnuts, acorns, etc., by proper treatment; 100 lb. of the former can be made to yield 34 lb. of a spirit containing 36 per cent. of alcohol. In the preparation of alcohol from this source the addition of 10 per cent. of barley malt is advisable. During the fermentation of the mash in the preceding operations it is customary to expose the vats to the action of the atmosphere for the first few days, after which time they are tightly closed in order to prevent the escape of the carbonic acid and the formation of acetic acid. The products of the fermentation of saccharine solutions include, in addition to carbon dioxide and alcohol, small proportions of glycerin and succinic acid.

Distillation of the Mash.—The fermented wort consists of volatile and non-volatile substances, the former comprising water, alcohol, fusel oil (a mixture of amylic, butylic, and propylic alcohols), small amounts of acetic acid, etc., the latter being vegetable fiber, decomposed and undecomposed yeast, malt, grain, salts, and small quantities of lactic and succinic acids and glycerin. Upon heating it to boiling in a still (see DISTILLATION) these bodies are separated, the vapors given off consisting essentially of alcohol and water. The boiling-point of the mixture is intermediate between that of alcohol and water (173° and 212° F.), but as distillation advances it becomes higher and the proportion of water carried over increases. The first distillate is termed "low-wines" or "singlings" which on redistillation constitute the "faints," the term whisky being usually applied to the spirit obtained by the distillation of the "faints," although diversity exists in the method of separating, purifying, and naming the different grades of spirit. It is not possible by simple distillation to separate the water from the alcohol completely, the purest spirit that can be obtained in this way still containing 11 per cent. of water. By carrying on the distillation to the furthest point, in order to obtain the greatest possible quantity of alcohol, a danger of promoting the formation of fusel oil is incurred, as this mixture boils at a much higher temperature than alcohol. Fusel oil has an unpleasant fiery and nauseous flavor, which is communicated to spirits containing it. Its complete removal can be effected by diluting the contaminated alcohol with water and redistilling, only the first part of the distillate being collected; but owing to the great expense thus incurred this is seldom resorted to. Fusel oil is chiefly contained in spirits prepared from potatoes, although it is also often present in that obtained from grain, especially when the solid substances introduced into the still have been allowed to become strongly heated, and undergo destructive distillation. The very numerous improved stills employed at present in the manufacture of spirits effect the separation of the alcohol and water either by causing the mixtures of alcoholic and aqueous vapors to pass through the alcohol at first distilled, by which process heat is generated and a secondary evaporation of the alcohol induced, or by cooling the mixed vapors to such a degree that only the water and fusel oil are condensed and returned to the body of the liquid. The nauseous smell and taste of bad whisky are often removed by filtration through, or distillation from, charcoal. Fusel oil can also be removed by oxidation with manganic acid (Attwood's process), by agitating the contaminated spirit with olive oil, or by distilling it from "gray salt" (potassium or sodium hydroxide) and "white salt" (potassium carbonate); likewise by agitating 665 parts of the spirit with 1 part of bleaching-powder, when a flavor resembling that of brandy is imparted to the product. A very large proportion of the whisky consumed in the U. S. and elsewhere is artificially prepared by reducing the raw products of the distillation of malt or potato spirits with water and adding certain substances to give a desired flavor. Creosote, for instance, is sometimes added to impart a whisky flavor to inferior grades of spirit; methyl alcohol is also used, but probably to a less extent. The presence of fusel oil in a liquor will often become apparent on simply removing the alcohol by evaporation; it is also detected by distilling the sample and adding sulphuric acid to the portion that distills between 230° and 240° F., when a red color will be produced; or by treating this portion of the distillate with sulphuric and acetic acids, when amylic acetate will be evolved; likewise by oxidation with potassium bichromate and sulphuric acid, by which the characteristic odor of valerianic acid will be engendered. If a small quantity of silver nitrate is added to a spirit containing fusel oil, this latter compound separates in the form of a black powder on allowing the mixture to stand exposed to the sunlight for a short time. The presence of creosote can often be detected by its imparting a blue color to ferric chloride. Pure whisky, when recently prepared, is nearly colorless, but if preserved in casks it gradually acquires a brownish color. It contains minute quantities of acetic, butyric, and valerianic acids, and, if distilled from a copper still, traces of this metal may also be present. It has a specific gravity ranging between 0·922 and 0·94, and should contain from 48 to 56 per cent. (by weight) of absolute alcohol.

In Great Britain and in the U. S. the excise on whisky has for many years been so great a source of revenue to the Government that there is no doubt of the fact of this and other spirits being consumed in a much larger quantity than is consistent with health and morality. In the U. S. an excise was first imposed on spirits in 1791. This was removed shortly afterward, but was again restored in 1812. Since

then the amount of tax has varied greatly; in 1862 it was 20 cents per proof gallon; in 1864 it ranged from 60 cents to $2; in 1868 it was 50 cents; in 1872, 70 cents; in 1886 it was 90 cents; and in 1895 it was $1.10, under provisions of the Tariff Act of 1894. In the fiscal year ending June 30, 1900 the total amount of whisky produced and deposited in distillery warehouses was: Bourbon, 19,411,829 taxable gal.; rye, 14,296,568; other (wheat, corn, malt, copper, and potato), 33,405,523; total, 67,113,920 gal. The total of distilled spirits was 109,245,187 gal., and the total revenue receipts thereon were $109,868,817. The following table shows the production of whisky by States in the fiscal year 1893–94 in taxable gallons:

STATES.	Bourbon.	Rye.	Other.	Aggregate.
Alabama	.....	.....	13,734	13,734
Arkansas	.....	2,143	80,592	82,735
California	.....	15,144	.....	15,144
Colorado	.....	.....	584	584
Connecticut	.....	4	.....	4
Georgia	.....	780	278,689	279,469
Illinois	30,265	29,266	3,557,826	3,617,357
Indiana	404,020	11,116	3,077,345	3,492,481
Kentucky	14,591,178	1,426,162	1,178,132	17,195,472
Maryland	.....	2,064,422	179,435	2,243,857
Minnesota	36,136	13,020	26,947	76,103
Missouri	174,121	4,248	82,292	260,661
Nebraska	6,750	7,707	92,471	106,928
New Jersey	.....	311,601	.....	311,601
New York	90,222	33,013	9,093	132,328
North Carolina	.....	2,990	654,383	657,373
Ohio	147,142	340,781	4,379,056	4,866,979
Oregon	.....	.....	3,120	3,120
Pennsylvania	.....	5,414,479	42,832	5,457,311
South Carolina	.....	.....	45,327	45,327
Tennessee	.....	.....	571,502	571,502
Texas	.....	.....	30,653	30,653
Virginia	.....	104,780	62,258	167,038
West Virginia	5,962	187,288	.....	193,250
Wisconsin	32,553	57,600	68,065	158,218
Totals, 1894	15,518,349	10,026,544	14,434,336	39,979,229
Totals, 1893	40,835,873	16,702,240	17,305,773	74,843,886
Decrease, 1894	25,317,524	6,675,696	2,871,437	34,864,657

The internal revenue receipts on the manufacture of distilled spirits in the fiscal year ending June 30, 1895, were $79,862,627. Revised by IRA REMSEN.

Whisky Rebellion: the name applied to the popular resistance to the excise laws in the four western counties of Pennsylvania in 1794. The assumption by the Federal Government of the right to levy an excise met with serious opposition on political grounds as dangerous to the liberty of the individual, but in Western Pennsylvania in addition to political opposition there was a strong feeling that the tax was an unfair discrimination against the people of that region. There whisky was the staple product and in such general demand that, like tobacco in colonial times, it served as a medium of exchange. The usual price being a shilling a gallon, a tax of 7 cents a gallon, as by the act of May, 1792, seemed excessive, and the law was further objectionable on account of the official inspection of private property which it entailed. Attempts to enforce the law met with violent resistance and those who conformed to its provisions were visited with insults and abuse. Those who took part in these outrages took the name of Tom the Tinker, and threatening posters over this signature appeared throughout the disaffected region. In July, 1794, an attempt to serve writs on the violators of the law provoked an attack on the house of the inspector which resulted in the killing of one of the rioters; and on the following night blood was again shed in an encounter with the marshal and his men. The mail was robbed at the instigation of David Bradford, one of the ringleaders, who afterward induced the insurgents to call out the militia, seeking thereby to involve so many in the crime of resisting legal authority that the Government could not inflict the full measure of punishment. Pittsburg, some of whose inhabitants had given offense to the "Whisky Boys," as they were called, was threatened with destruction and obliged to expel the offending persons from the town. In Western Pennsylvania the movement was fast becoming an open rebellion, and the spirit of revolt was spreading in the neighboring counties of Virginia and Maryland. Governor Mifflin of Pennsylvania hesitated to take decided action, and would not at first call out the militia. The President, however, acted with vigor and made a requisition for about 13,000 militia from the States of Pennsylvania, New Jersey, Virginia, and Maryland. They were ordered to be ready to move by Sept. 1, but before that date commissioners were dispatched by the President and the Governor of Pennsylvania to offer amnesty to the insurgents on condition of complete submission. At a meeting of the malcontents at Parkinson's Ferry some fiery speeches were made, but it was nevertheless agreed to send a committee to treat with the commissioners. One of the delegates at this meeting was Albert Gallatin, who favored a moderate policy and at a subsequent conference prevailed on his associates to accept the terms offered by the commissioners. The attitude of the people in the four counties, however, was still threatening, and it was not till the troops had actually begun their westward march that the insurgents lost courage. On the approach of the troops in October, commissioners from the insurgents met them with assurances of peace, but these not being regarded as sufficient the army kept on and entered Parkinson's Ferry. Many arrests were made and two of the prisoners were convicted of treason, but they were afterward pardoned by the President. At the first show of force the insurrection subsided at once. So far as immediate results were concerned it was of slight importance. Its chief significance lies in the fact that it was the first attempt forcibly to resist the Federal Government, that it decided the question whether the militia of one State would invade the soil of another at the call of the President, and that the precedent of a Federal excise was successfully established. See James Carnahan, *The Pennsylvania Insurrection of 1794*, in *Proceedings of the New Jersey Historical Society* (vol. vi., 1851–53); also J. B. McMaster, *History of the People of the United States* (vol. ii., 1885). F. M. COLBY.

Whist [etymology unknown; generally considered as a deriv. of *whist!* silence! sh! so called because the game requires silence and attention]: a game of cards, played by four persons, two being partners against the other two. The game is chiefly remarkable from the fact that it is the only one in which it is not only permitted but expected that the partners shall inform each other of the various combinations of cards that they hold; and this not by word of mouth, but by the order in which they play them under varying conditions of the game and score. To such an extent has this been carried that it is a task of no mean difficulty to master the many conventionalities in use by experts at the present day, and yet without this knowledge one can not be considered a fine player, no matter how shrewd he may be in other respects.

Elements.—The elements of the game are comparatively simple. A full pack of fifty-two cards is used. They are dealt one at a time to each player in rotation, and the last one is turned up, the suit to which it belongs being the trump for that deal. The player to the left of the dealer begins by leading any card he pleases, and the others must follow suit if they can; not to do so when able is called "revoking." Should any player have none of the suit led, he can either trump it or throw away a card of another suit, which is called "discarding." If none of the four cards played is a trump, the highest card of the suit led wins the trick, the rank of the cards being ace, king, queen, knave, ten, nine, eight, seven, six, five, four, three, two. Trumps win against all other suits, the highest trump played taking the trick. Whoever wins the trick has the lead for the next one. When more than six tricks have been gained by one side, it is usual to lay apart all those above six, as they are the only ones that count. For instance, if after the whole thirteen have been played, one side has gained five and the other eight, the latter counts two by cards, the former nothing. The ace, king, queen, and knave of trumps are called honors, and if honors are counted, the partners are entitled to claim one point for each honor that they hold more than their adversaries. The side first making five points, or under the American laws seven, is the winner of the game, and the side winning two out of three games wins the rubber. If the first two games are won by the same partners, the third is not played.

Modern Whist.—A careful examination of the rather extensive literature of whist will show that it is a popular fallacy to suppose that the leading principles of whist strategy are modern. Nothing is more common than the claim that the original lead of the longest suit is the peculiar feature of modern whist. There is no evidence that it was ever considered good play to lead singletons. The essential difference between modern whist and the style of game which we call old-fashioned lies in the recognition of the principle

stated by Clay: "It is of more importance to inform your partner than to deceive your adversary." This is not universally true, and it might be qualified by saying that information is of more use to the strong hand than to the weak, for when the adversaries develop great strength, or a partner shows decided weakness, to give exact information would be very bad whist.

The almost universal adoption of the information-giving mode of play required that there should be some generally understood method of communication, and a system was slowly elaborated by the best players and by writers on the game, which, while keeping in view the original purpose, trick-making, proceeded upon the principle that where any one of two or more cards would equally answer the purpose in view, the selection should be made in accordance with conventional rules for the purpose of giving information. For instance, a player with the lead, having the ace and king of a suit, might play either so far as trick-making was concerned, but for his partner's information he should always play the king, which, by its winning, would indicate the ace; therefore if a player first led the ace it would inform his partner that he had not the king.

Modern whist may then be divided into two parts: (1) The purely conventional rules, which must be learned from books or gathered from other players; (2) the strategy of the game, which depends on the shrewdness of the individual, and the skillful use of the information afforded by the conventional plays. One can become a fair player with the first without the second, but not with the second without the first. The combination of both makes the expert. Unfortunately the tendency of latter-day whist is so to complicate the conventional part of it that most persons mistake it for the entire matter, and never reach the second stage. All modern works on whist are devoted too much to conventionalities, only one, Foster's *Duplicate Whist*, being exclusively devoted to strategy.

These conventional methods of communication, which every player should know by heart, may be divided into two classes, those used in *attack* and those required for *defense*. In attack the facts required to be known are: (1) The general strength or weakness of the hand and the best suit it contains—shown by the original lead. (2) Whether the suit is "established" or not, and if not how much establishing it needs—shown by always leading from certain combinations of cards in certain ways under similar conditions. (3) The assistance that can be given to the partner—shown by the return leads and the management of trumps. (4) The number of trumps held—shown by leading them, by "calling" for them, by "echoing," by "passing," and by "forcing." In defense the partners require to know: (1) What chance there is of stopping the adverse suits—shown by the second-hand play, and by the last player winning the trick with the lowest possible card. (2) The suits which are best protected. (3) The suits which it is desirable to have led; and (4) the suits which it is necessary to avoid—all shown by the discard. The details of this system are briefly as follows:

In Attack.—1. The strongest suit is usually selected for the original lead. It may be strong numerically, as five or six cards, or intrinsically strong by reason of high cards. If there is a choice the numerically strong suit should be selected, the high cards in the other being kept as cards of re-entry. The point to which the manœuvers of all good players tend is to establish and bring in their long suit. It is useless to play for this unless the suit is accompanied by some card of re-entry, and the holder or his partner has probably sufficient trump strength to defend it. When a player has no good suit, or a long weak suit without any card of re-entry, it is better to lead some card, even from a short suit, which will warn the partner at once that the hand is weak. Such leads are called "forced." If the hand contains five trumps it is usually best to lead them, regardless of the remainder of the hand. Four trumps should be led from if the leader or his partner has an established suit, with a probable card of re-entry. Three, or even less, may be led from if the rest of the hand is unusually strong, or if it is desirable to stop the adversaries from trumping.

2. *Leads.*—The condition of the suit led from is shown by the card selected from each of the various combinations. The king is led if it is accompanied by either the ace or the queen, or both. The ace is led if there are five or more cards in the suit, or if it is accompanied by both the queen and knave, with or without other cards. The queen is led if accompanied by the knave and ten and there is no higher card in the suit. The knave instead of the king is led from the sequence of king, queen, knave, and not less than *five* cards in the suit. The ten is led if accompanied by the knave and the king. Having none of these combinations, the fourth-best card is selected to inform the partner that three higher remain in the hand, but that they do not form any of the combinations from which a high card would be led. When a weak suit of only three cards is led from, the highest is played, unless it is an ace, king, or queen. Queen may be led if the knave is present. Trumps may be led differently when the object is not to exhaust them immediately, but simply to play them as the strongest suit. The fourth-best may be led, even with ace and king, or king and queen, or ace and four or more others. Holding the four honors, or ace, king, and queen, the lowest of the winning cards is first played. Other combinations are led from as in plain suits.

On the second round of a suit the player leads the best card of the suit if held, or holding two or more equally the best, the lowest that will win the trick. Holding second and third best, such as queen and knave, after the ace has been played he leads the queen if three of the suit remain; the knave if four or more. If a card which is not the best wins, such as a king led from king and queen, the partner may be assumed to have the best, and a small card be led to him. A queen led is followed by the knave if three cards remain, by the ten if four or more. A fourth-best is followed by the best if held, or by another small one.

American Leads.—A system of leading in which an attempt is made to show the number in the suit as well as the combination of high cards has lately been advocated by Hamilton, Fisher Ames, and "Cavendish" in his twentieth edition. The idea is old, and has been several times unsuccessfully advocated during the nineteenth century. The key to it is that the king is not led if there are more than four cards in the suit. From ace, king, the ace is led; from ace, king, queen, the queen; from the four court cards, the knave. The system has been on trial for several years, but is still condemned by a number of those recognized as players of the first class, also by such writers as Drayson, Pembridge, Mogul, and Foster. The chief objection to it is that on the first round these leads may mean anything, and on the second they seldom convey more than the leads in general use. Of the nine principal combinations from which court cards are first played, it is usual to lead the king from five, the ace from two, and the queen and knave from one each. The new system, by rejecting the king, has to make the ace, queen, and knave each represent three of these nine combinations, which often leads to confusion. The new leads are very attractive to those who think giving information is the chief object in whist, and winning the game a secondary consideration. When opposed to mere book players they do little harm, but they put weapons into the hands of a shrewd adversary, and are particularly weak when opposed to false cards judiciously played.

3. *Partner's Duties.*—A systematic method of leading enables the partner to estimate the probable contents of the leader's hand. If an ace is led the leader may be credited with at least four more of the suit, or both queen and knave, but not the king. If king is led he has either ace or queen, perhaps both. If queen is led he has neither ace nor king, but probably both knave and ten. If ten is led he has probably both knave and king. If a knave is led he has either king and queen, with a long suit, or he has a very weak hand. When a small card is led it is probably the best suit, and the partner does his best to win the trick, but as cheaply as possible. Holding ace and king, the king wins it the most cheaply. Holding ace and queen, the queen may be "finessed."

When the partner of the original leader wins the first trick he may do any one of four things: 1st. Lead trumps, if he has five or more, or four with an established suit and a card of re-entry. 2d. Lead back the best card of the leader's suit, if he holds it, before introducing his own. 3d. Lead his own suit, if it is worth trying to establish. 4th. Return the leader's suit, with the lowest if he has three or more remaining; with the higher if only two, no matter what they are. When the original lead is a trump the partner should always return it if he has one.

4. *Trump-signals.*—Counting the trumps is very important. Leading them at the right moment decides many a game. A player not having the lead, but wanting trumps out, can "call" for them if he has two cards such as the

five and three of a suit led, by playing the five first, then the three. The best players are divided in opinion as to the value of this artifice, some thinking it an unmixed evil. It is very useful to the beginner, as by its use a more experienced partner can direct him.

When a player leads trumps his partner can show four or more by "calling" in the trump suit. This is known as the "echo." The absence of the echo shows he has not four. A player may show four trumps by "passing" a doubtful trick; as when he is second player to a small card led of a suit of which he has none. A player leading a suit with the evident intention of "forcing" his partner to trump it shows strength in trumps, as it is usually bad play to do so with a weak trump hand. When an adversary leads trumps it is always well to "force" him to use his trumps for ruffing. Many fine hands are ruined by being forced. The usual rule is: "Always force the strong, seldom the weak, never both."

In Defense.—1. The second player to an adverse lead of a small card should play a high card if he has any combination from which he would *lead* a high one. If he holds king, knave, ten, and a small card, he should play the ten second hand; or holding king and queen, with others, the queen. This will indicate to his partner that he holds certain combinations of high cards in the adverse suits. The fourth player may win a trick with a knave, showing his partner that he holds still higher cards, as the leader could not have held both ace and king, or king and queen, or all three of them, and the third player could not hold any of them.

2. When the adversaries play a strong attacking game, as by leading trumps, or when a player is weak in trumps, he must keep guard on the adversaries' suits, and discard from his own or his partner's. When a player can not follow suit to an adverse lead of trumps he usually discards from his best-protected suit.

3. It must not always be assumed that a player on the defensive wants the suit led from which he discards. If he has no trumps, and if he "calls" in his discards, the suit in which he calls should be led to him by his partner at the first opportunity. The discard of the best of a suit will also show the command of it.

4. When a player on the defensive discards the lowest of a suit, it is not wise to lead that suit to him. When he discards the second-best of a suit he does so to show that he has not the best, and can not win a trick in that suit.

When a player wins the first trick of an adversary's original lead he must be guided by his position at the table. If he is second player he must open another suit; but if fourth player it is usually better to lead back the same suit than to open a weak one of his own.

Many of the stratagems in use by experts can be learned only by long practice at the whist-table. These are such as finessing, underplay, placing the lead, false cards, making tenaces, holding up winning cards, refusing to win tricks, and delusive discards. A most important thing is judgment of character, and no one can play his best among strangers.

Duplicate Whist.—For the purposes of match play there has lately come into use the form of whist known as "duplicate," called "rejoué" in Foster's *Duplicate Whist.* The cards are dealt as usual, but each player lays the one he plays in front of him on the table, the winner of the trick taking a counter from thirteen previously placed there. The cards of each of the players are kept separate, and are preserved by some one of the many mechanical devices invented for the purpose. Each deal is called a "hand," and a new pack is required for every deal, until an agreed number have been played, usually 12, 16, 20, or 24. The original hands are then, one at a time, placed on the table again, face down, and taken up and replayed; but the cards originally held by one pair of partners are now given to the other. Each side should make thirteen tricks in the original and the duplicate play taken together; if they fail to do so the number is the measure of their loss. If one pair, having the lead, make eight tricks out of thirteen on the original play, and the other pair with the lead make only seven on the duplicate play of the same cards, the latter have lost a trick. It is usual to have four players on each side, arranged at two tables, the hands played at one table being taken to the other for the overplay, to prevent any chance of the hands being memorized. This form of whist is supposed to eliminate luck. It does not do so entirely, but it is the nearest approach to it yet suggested.

Dummy and Double Dummy.—In dummy two are partners against one, who turns face up on the table his dummy partner's cards, which he plays to suit his own hand. The main point in the game is to lead up to dummy's weak suits and through his strong ones. In double dummy two single players each turn up their dummy partner's cards. This game is entirely analysis, like chess. There is only one work exclusively on dummy, *Le Whist à Trois*, by Charles Lahure. It has never been translated.

Laws of Whist.—There are at present extant two codes of laws: the English, generally known as the "Club Code," given in full in *Cavendish on Whist*, and the American Whist League Code, given in full in Foster's *Whist Manual.* Their chief differences are as follows: In the English code the game is five points, honors are counted, and rubbers are played. The penalty for a revoke is the loss of three tricks, or the deduction of three points from the score of the revoking players, or the addition of three points to that of their adversaries. The last trick may be seen. In the American code the game is seven points, no honors are counted, and no rubbers played. The value of the game is determined by deducting the score of the losers from seven. The penalty for a revoke is the loss of two tricks. The last trick can not be seen. There are ninety-one laws in the English code, forty in the American. The following should be familiar to every player:

In scoring games the penalty for a revoke counts first, tricks next, and honors last. When the players begin a hand at the score of four they can not count honors; they must make the odd trick to win the game.

Honors, unless claimed before the trump card of the following deal is turned up, can not be scored.

An erroneous score can be corrected at any time during the game in which it occurs.

A misdeal loses the deal. The dealer may not count the cards he has dealt, nor the remainder of the pack.

Exposed cards, such as cards played in error, two or more played at once, or a card dropped face upward on the table, must be left there, and can be called by the adversaries; but the adversaries can not prevent their being played when the opportunity offers.

If a player leads out of turn the adversaries may call a suit from the player in error or from his partner when it is next the turn of either of them to lead. If the other three have played before the error is discovered it can not be rectified.

A revoke is established after the trick in which it occurs is turned and quitted. The revoking players can not win the game that hand, no matter what they score.

Any player may ask the others to indicate which of the cards on the table they played, provided the cards have not been touched for the purpose of gathering them.

History and Literature.—The origin of the game is a mystery, although some writers on the subject fancy they have solved it. The word "whist," so spelled, occurs for the first time, so far as known, in *Hudibras the Second Part*, published in 1663:

> But what was this? A game at whist. . . .

Several attempts have been made to derive whist from the old French and Italian games of "triumph," referred to by Rabelais and other writers early in the sixteenth century. This has now been abandoned by the best judges. The English game of "ruff and honors" is sometimes put forward as the father of whist; but Charles Cotton, in the *Compleat Gamester*, published in 1674, follows up his description of the game ruff and honors by specifying whist as a different game. In both games only twelve cards were dealt to each player; but in ruff and honors the whole pack was used, the trump being turned from the remaining four, and these four were "ruffed," or taken in by the holder of the ace of trumps. In whist the four deuces were thrown out of the pack, and the forty-eighth card was turned up for trump. A variation known as "whisk and swabbers" seems to have flourished about the same time, the "swabbers" being a parasite growth, resembling the "joker" in a euchre pack. In all these the game was nine points, honors were counted, and the players could "call" at eight. Early in the eighteenth century it became the custom to use the entire pack of fifty-two cards, thus introducing the odd trick, and ten points became the game, honors being called at eight as formerly.

Hoyle.—It does not appear that whist was originally in favor among the better classes of society, who devoted their

time to piquet, ombre, and quadrille. Daines Barrington informs us that about 1728, a little whist school used to meet at the Crown Coffee-house in Bedford Row, London. Its leading spirit seems to have been the first Lord Folkestone, and it is to be regretted that he did not anticipate the famous little whist school of 1860 by keeping some record of their studies and publishing the results. All that is known of their game is that they established, if they did not discover, the advantage of leading from strong suits, of studying their partner's hand, and of playing to the score. It is more than probable that the famous Edmund Hoyle was a frequenter of the Crown, and, if not actually a member of the school, was familiar with its teachings, to which he added a number of calculations on odds and an artificial method of arranging the cards in the hand so as to assist the memory. This fund of information he communicated to private pupils for the sum of one guinea, but in 1742–43 he published his laws under the name of the *Short Treatise*. The only copy known to be genuine of the first edition of this remarkable book is in the Bodleian. The laws laid down by Hoyle were revised by the members of White's and Saunders's, and remained the authority for over a century. Hoyle died in 1769, yet for forty years after his death his book was the standard work on whist.

Paine's *Maxims* was published about 1770, and was regarded as the authority about the beginning of the nineteenth century.

Matthews.—About 1804 Thomas Matthews published his *Advice to the Young Whist Player*. This rapidly became the authority, and is still regarded by experts as one of the best works on whist, most of the modern writers borrowing from it very freely. The author was regarded as the best player of his day, and there are many who believe that he and Deschapelles were the only two men that ever mastered the game. In the seventh edition (1813) short whist spoken of for the first time, and some notes on its influence on whist strategy.

In 1822 Admiral Burney brought out his *Treatise*, largely plagiarized from Matthews, and in 1835 Matthews's work was rewritten by Major A.

Deschapelles.—In 1839 a Frenchman, M. Deschapelles, who enjoys the reputation of being the finest whist player that ever lived, published his *Traité du Whiste*, a commentary on the then existing laws, and of no value to the modern player. He was famous for his finesse, and all who played with him seem to have acknowledged his genius; yet not a single game of his is extant, and only one *coup* bears his name.

"Cœlebs," in 1851, makes the first mention of the now universal trump-signal. Many other writers followed, such as Bob Short, Cam, and Walker. All these followed the maxim system more or less closely, and their works suggest the idea of a collection of lectures delivered to stupid partners at the whist-table, hastily noted down at the time, and given to the printer without further revision.

Cavendish.—In 1862, under the title of *The Laws and Principles of Whist*, a writer adopting the pseudonym of Cavendish made the first attempt to state the general principles of play, and for the first time published illustrative hands. This work is still the standard all over the world.

In 1864 James Clay published his *Short Whist*. He was one of the finest players of his day, but not so exact nor so logical a writer as Cavendish. The famous *Westminster Papers* were issued from 1868 to 1879, forming a most interesting collection of whist jottings and examples of the skill of famous players. Dr. Pole's *Theory of Whist* appeared in 1870. It is ingenious, but considered unsound, as it fails to take into account the theory of weak leads. His *Philosophy of Whist* is an abstruse essay on the intellectual and scientific aspects of the game.

Drayson.—In 1879 Maj.-Gen. Drayson published the *Art of Practical Whist*, in which the ante-penultimate leads were given for the first time. The principles of these leads has since been erroneously attributed to N. B. Trist, who suggested in a letter to the *Field* that they be called fourth-best leads. Drayson also introduced some radical changes in the management of trumps, and he is regarded as the authority on that subject.

Proctor published in one volume the whist matter that had appeared in *Knowledge* from month to month. "Pembridge," a bitter opponent of the ultra refinements of the modern school, wrote *Bumblepuppy* and the *Decline and Fall of Whist*, two very bright essays on how *not* to play whist. In 1889 Foster's *Whist Manual* was published, following closely upon his invention of the "self-playing whist cards." In the *Manual* he collected the latest and best systems of play, and arranged them with a view solely to enabling the student to master them rapidly and easily. Systematic exercises with the cards were given for the first time, the play of the second hand was simplified, and his discovery of the eleventh rule was published. A second series of the self-playing cards followed, then a *Pocket Guide to Modern Whist*, Foster's *Duplicate Whist*, and *Whist Strategy*, and *Whist Tactics*.

In the U. S. several authors have published works on whist. "G. W. P." wrote *American Whist*, *Whist Universal*, and *Whist in Diagrams*. Instead of following the usual custom and presenting the results of the experience of the best players up to his own time, this author insisted on certain theories of his own. Fisher Ames has published two works —*A Practical Guide to Whist* and *American Leads at Whist*. They follow the new style of leading, and are written on the maxim system. C. D. P. Hamilton's *Modern Scientific Whist* is the most voluminous work on the subject so far published. It contains 600 pages of exhaustive analysis, every possible position of the cards being illustrated in diagram. He advocates the informatory game, with the American system of leads. R. F. Foster.

Whistler, James Abbott McNeill: figure, landscape, and portrait painter; b. in Lowell, Mass., in 1834; pupil of Gleyre in Paris; settled in London in 1863; received a third-class medal at the Paris Salon of 1883, and a first-class medal at the Paris Exposition of 1889; became an officer of the Legion of Honor 1891, and a member of the Society of American Artists 1880. His works are individual in character, and are notable for subtle color-harmony. He is one of the greatest of modern etchers, and has painted some masterly portraits. His *Portrait of my Mother*, painted in 1872 and exhibited in New York at the Society of American Artists in 1882, was, in 1892, bought by the French Government for the Luxembourg Gallery, Paris. He published *The Gentle Art of Making Enemies* (1890; enlarged ed. 1892). His studio was in London for a number of years, but in 1892 he removed to Paris. William A. Coffin.

Whiston, William: clergyman and mathematician: b. at Norton, Leicestershire, England, Dec. 9, 1667; educated at Tamworth School; entered Clare Hall, Cambridge; obtained a fellowship there 1693, and became a mathematical tutor; took orders in the Church of England 1693: was chaplain to the Bishop of Norwich 1694–98, and vicar of Lowestoft 1698–1701; became deputy to Sir Isaac Newton in the Lucasian professorship of Mathematics at Cambridge 1701, and succeeded to that chair in 1703, but was deprived of it and expelled from the university Oct. 30, 1710, in consequence of having expressed Arian views in the Boyle lectures; was pronounced a heretic by the convocation of 1711; was pardoned by an "act of grace" 1715; removed to London, where he gave private lectures on astronomy and natural philosophy; was an active writer on theological subjects; became a Baptist and a Millenarian, and gathered a congregation in his own house to which he expounded "primitive Christianity" and predicted the advent of the millennium and the restoration of the Jews to Palestine in 1766. He was the author of *A New Theory of the Earth* (1696). Of his many other works the best known are *The Accomplishment of Scripture Prophecies* (1708); *Primitive Christianity Revived* (5 vols., 1711–12); *The Primitive New Testament* (1745); and his translation of the *Works* of Josephus (folio, 1737), which has been carefully revised by Rev. A. R. Shilleto, in Bohn's Library (1890). A curious and interesting account of his life is given in his *Memoirs* (1749–50). D. in London, Aug. 22, 1752.

Revised by S. M. Jackson.

Whitaker, Rev. Nathaniel, D. D.: b. on Long Island, N. Y., Feb. 22, 1732; graduated at Princeton College in 1752; entered the ministry, and took charge of a church at Chelsea, near Norwich, Conn., where he remained until 1761, when he was deputed by the Scotch Society for the Advancement of Learning (of which there was a branch in Connecticut) to visit Scotland, England, and Wales for the purpose of obtaining donations for the establishment of an institution of learning in America for the education and christianization of the North American Indians. He took with him Rev. Samson Occom (*q. v.*), an educated Indian, who had been licensed to preach by the Presbyterian denomination. The General Assembly of the Church of Scotland warmly sympathized with their plans and pur-

poses. In England the mission also met with favor. (See *Extracts of Several Sermons Preached in the City of Bristol by Nathaniel Whitaker and Samson Occom*, Bristol, 1766.) The Earl of Dartmouth, then secretary of American affairs, received the strangers with great kindness, and generously promoted their object by his benefactions. The king, George III., it is said, himself gave £400 to the cause. From different sources there was contributed to the fund, during the two years of Dr. Whitaker's visit to Europe, the sum of £11,000, to which considerable additions were afterward made before the outbreak of the American Revolution. With an endowment so obtained, Dartmouth College at Hanover, N. H., was founded. On his return from Europe, Dr. Whitaker formed a Presbyterian church at Salem, Mass., and officiated there for a number of years. He afterward removed to Maine and thence to Virginia. Many of his sermons were published and extensively circulated throughout New England. He was an ardent Whig, and zealously supported the cause of the colonies in their struggle for independence in 1776. D. at Woodbridge, Va., Jan. 21, 1795. Revised by S. M. JACKSON.

Whitaker, OZI WILLIAM, D. D.: bishop; b at New Salem, Mass., May 10, 1830; graduated at Middlebury College, Vermont 1856; was principal of the North Brookfield (Mass.) High School for four years; graduated at the General Theological Seminary of the Protestant Episcopal Church in 1863; was ordained deacon in Boston July 15, 1863, and priest Aug. 7 of the same year; was rector of St. John's church, Gold Hill, Nev., from Oct., 1863, to July, 1865; was rector of St. Paul's, Englewood, N. J., from Oct., 1865, to Feb., 1867; became rector of St. Paul's, Virginia City, Nev., in Apr., 1867; was elected missionary Bishop of Nevada and Arizona in 1868, and consecrated in New York Oct., 1869. Bishop Whitaker was elected assistant Bishop of Pennsylvania in 1886, and became the diocesan on the decease of Bishop Stevens in June, 1887. Revised by W. S. PERRY.

Whitby: town; in the North Riding of Yorkshire, England; at the mouth of the Esk in the North Sea; 54 miles N. N. E. of York (see map of England, ref. 5–I). It has a good harbor, protected by two piers, 300 and 800 yards long, jutting out into the sea; drydocks for building and repairing ships; manufactures of sailcloth and cordage, and an extensive trade. Jet, alum, and iron ores are exported. A monastery founded here in 657 by St. Hilda was burned by the Danes in 867, and was rebuilt in 1078 as a Benedictine abbey for monks. Pop. (1891) 13,274.

Whitby: town of Ontario, Canada; capital of Ontario County; on the north shore of Lake Ontario; on the Grand Trunk Railway, 31 miles E. of Toronto (see map of Ontario, ref. 4–E). Its port is one of the best on the Canadian shore of Lake Ontario. Its original name was Windsor, but this was changed because of the Windsor on the Detroit river. Pop. (1891) 2,786. M. W. H.

White, ANDREW DICKSON, LL. D., L. H. D.: educator; b. at Homer, N. Y., Nov. 7, 1832; removed in childhood to Syracuse; graduated at Yale College 1853; traveled in Europe; was several months an *attaché* of the U. S. legation in Russia; studied at the University of Berlin 1854–55; was Professor of History and English Literature at the University of Michigan 1857–63; visited England 1863; returned to Syracuse; was State Senator 1863–66; introduced the bills which codified the school laws, created the new system of normal schools, and incorporated Cornell University; was chosen first president of that institution 1866; visited Europe to purchase for it books and apparatus and to study modern educational methods; has been a liberal contributor to the university, in which, besides the presidency, he filled the chair of Modern History until his resignation June 17, 1885; was one of the commissioners sent by President Grant to Santo Domingo to study the question of annexation 1871; was U. S. minister to Germany 1879–81, and to Russia 1892–94; was appointed a member of the Venezuela boundary commission Jan. 1, 1897, and ambassador to Germany in 1897. He presented his historical library, comprising about 20,000 volumes, besides some 10,000 pamphlets and many rare manuscripts, to Cornell University, and has since enlarged the gift by continued benefactions. Author of *Outlines of Lectures on Mediæval and Modern History* (Detroit, 1861; Ithaca, 1872, etc.); *A Word from the Northwest* (1863), in reply to Dr. W. H. Russell; *The Plan of Organization for Cornell University* (1868); *The New Education* (1868), being his inaugural address; a *Report on the Co-education of the Sexes* (1871); *Paper Money Inflation in France* (1876, 1882); *A History of the Doctrine of Comets* (1887); *A History of the Warfare of Science with Theology in Christendom* (2 vols., 1896); and many addresses and magazine articles, mainly on historical, political, and educational topics. Revised by GEORGE L. BURR.

White, CHARLES ABIATHAR, A. M., M. D.: geologist; b. at North Dighton, Mass., Jan. 26, 1826; removed to Iowa in 1839, and graduated at Rush Medical College, Chicago, 1863; was State geologist of Iowa 1866–70; Professor of Natural History in the Iowa State University 1867–73; from 1873–75 held a similar position at Bowdoin College, and since 1874 has been connected with different national geological surveys. He was appointed geologist to the U. S. Survey 1882, and paleontologist 1883, which office he still holds in connection with honorary curatorship in U. S. National Museum. He was elected a member of the National Academy of Sciences 1889. His principal works are *Report on the Geological Survey of the State of Iowa* (1870); *Manual of the Physical Geography and Institutions of the State of Iowa* (1873); *Bibliography of North American Invertebrate Palæontology*, contributions to *Invertebrate Palæontology*, Nos. 1, 2, and 8 (1879–83); *A Review of the Non-Marine Fossil Mollusca of North America* (1883); *A Review of the Cretaceous Formations of North America* (1891); *The Texan Permian and its Mesozoic Types of Fossils* (1891); and other scientific works, numbering in all nearly 200 titles. An *Annotated Catalogue* of his writings was published in Washington, D. C., in 1885. Revised by C. H. THURBER.

White, GILBERT: clergyman and author; b. at Selborne, Hampshire, England, July 18, 1720; educated at Basingstoke School and at Oriel College, Oxford; graduated 1743; became a fellow of Oriel 1744, retaining that place through life; became senior proctor of the university 1752; took orders in the Church of England, but declined ecclesiastical preferment, though officiating as curate at his native village, where he spent most of his life upon his paternal estate, chiefly occupied in those minute observations in natural history on which his fame is based. D. at Selborne, June 20, 1793. He was the author of *The Natural History and Antiquities of Selborne in the County of Southampton* (1789) and *The Naturalist's Calendar, with Observations in Various Branches of Natural History* (1795), a posthumous work made up from his papers by Dr. John Aikin. Among the naturalists who have published annotated editions of these two works (usually published together) may be mentioned Sir W. Jardine (1833), Capt. Thomas Brown (1835), Edward T. Bennett (1837), Blyth and Mudie (1850), Edward Jesse (1850), Rev. J. G. Wood (1854), Frank Buckland (London, 1875), and Richard Jefferies (1887). The newest edition (New York 1899) has an Introduction by George H. Ellwanger. A volume of his *Letters* was issued by J. E. Harting (1876).

White, HENRY KIRKE: poet; b. at Nottingham, England, Mar. 21, 1785; was the son of a butcher; was apprenticed to a stocking-weaver, and afterward to an attorney, in whose office he found time to study the classics and several modern languages, as well as English literature, drawing, and music; began to write verses for magazines in his fifteenth year; gained several prizes offered by publishers of periodicals; printed a volume, *Clifton Grove, a Sketch in Verse, with other Poems* (1803), which won for him the high regard of Southey and other men of letters, by whom he was encouraged to study for the ministry; obtained a sizarship at St. John's College, Cambridge, 1804; was for two years at the head of his class, and became a tutor in mathematics, but destroyed his health by excessive study, and died of consumption at Cambridge, Oct. 19, 1806. His papers were placed in the hands of Southey, who published his *Remains, etc., with an Account of his Life* (2 vols., 1807; vol. iii., 1822), which obtained for him a permanent place in English literature. A republication of his *Poetical Works* was issued (London, 1869). Revised by H. A. BEERS.

White, HORACE, M. A.: journalist; b. at Colebrook, N. H., Aug. 10, 1834; graduated at Beloit College, Wis., in 1853. He was for many years connected with *The Chicago Tribune*, and was its editor 1865–74. From 1883 he, conjointly with E. L. Godkin, edited *The Evening Post* (New York). Besides editing other economical works, he is the author of *Money and Banking, Illustrated by American History* (Boston, 1895).

White, HUGH LAWSON: jurist; b. in Iredell co., N. C., Oct. 30, 1773; son of Gen. James White (1759–1821), a pioneer

settler of Knoxville, Tenn., where he removed 1786. The son served as a volunteer against the Cherokee Indians 1792; studied at Philadelphia 1794–96; read law at Lancaster, Pa.; began practice in Knoxville 1796; was judge of the State Supreme Court 1801–07 and 1809–15; became U. S. district attorney 1807, State Senator 1809 and 1817, president of the State Bank of Tennessee 1815, and commissioner of Spanish claims 1820; was U. S. Senator 1825–35 and 1836–39; president *pro tem.* of that body 1832; received the electoral votes of Georgia and Tennessee for President of the U. S. at the election of 1836; and resigned his seat in the Senate 1839, in consequence of having received from the Legislature instructions requiring him to vote contrary to his judgment. D. at Knoxville, Tenn., Apr. 10, 1840. A *Memoir, with Selections from his Speeches and Correspondence* (Philadelphia, 1856), was prepared by Nancy N. Scott, one of his descendants.

White, John: clergyman; b. at Stanton, St. John, Oxfordshire, England, in 1574; educated at Oxford; became perpetual fellow of New College 1595, and rector of Trinity church, Dorchester, 1606; was one of the most efficient promoters of the colonization of New England, and especially of Dorchester and Gloucester, Mass., both by his pen and by his personal influence; was known as the patriarch of Dorchester, and was a member of the Westminster Assembly of divines. D. at Dorchester, England, July 21, 1648. He was the author of *The Planter's Plea, or the Grounds of Plantations Examined and Usual Objections Answered* (London, 1630); *The First Century of Scandalous, Malignant Priests Made and Admitted into Benefices by the Prelates* (1643); *A Commentary upon the Three First Chapters of Genesis* (1656), etc. Revised by S. M. Jackson.

White, John Williams: Greek scholar; b. at Cincinnati, O., Mar. 5, 1849; graduated at Ohio Wesleyan University, Delaware, O., 1868; appointed Professor of Greek and Latin at Willoughby College, Ohio, 1868; at Baldwin University, Ohio, 1869; tutor of Greek in Harvard College 1874; assistant Professor 1877–84, when, upon the death of Prof. Sophocles, he was elected to fill the vacant chair. He published numerous school-books and a number of archæological papers, and is one of the editors of Ginn's College Series of Greek Authors. Alfred Gudeman.

White, Joseph Blanco: author; b. at Seville, Spain, July 11, 1775, of an Irish Catholic family settled in Spain; was known in Spain as José Maria Blanco y Crespo; was ordained a priest 1799, but soon lost confidence in Roman Catholicism, though continuing in its priesthood until 1810, when, in consequence of the political crisis in Spain, he went to England; was tutor in Lord Holland's family; conducted a monthly Spanish paper, *El Español* (1810–14), rendering services to the cause of Spanish independence, which were rewarded by the English Government with a life-pension of £250; took orders in the Church of England; resided in London as a man of letters, producing several works in Spanish and English; conducted (1822–25) another Spanish journal, *Las Variedades*, and was editor of the short-lived *London Review* (1829); was tutor in the family of Archbishop Whately at Dublin 1832–35, after which he avowed himself a Unitarian; settled at Liverpool, where he died May 20, 1841. Among his publications were *Letters from Spain, by Leocadio Doblado* (1822); *Practical and Internal Evidence against Catholicism* (1825); *The Poor Man's Preservative against Popery* (1825); *Second Travels of an Irish Gentleman in Search of a Religion* (2 vols., 1833); and an instructive autobiography in the form of letters, addressed chiefly to Archbishop Whately, edited by Rev. J. H. Thom as a part of *Life and Correspondence* (3 vols., 1845). Blanco White's *Night and Death* was called by Coleridge the finest sonnet in the English language.

White, Peregrine: the first child of English parentage born in New England; was the son of William White and his wife Susanna, passengers in the Mayflower, and was born on that vessel in Cape Cod Bay on Nov. 20, 1620; became a citizen of Marshfield, where he was given 200 acres of land in "consideration of his birth"; was "vigorous and of a comely aspect"; filled various civil and military offices, and reached a good old age, dying at Marshfield, July 22, 1704. His father died during the first winter at Plymouth, and his mother married Gov. Edward Winslow, theirs being the first marriage in New England.

White, Richard Grant: Shakesperean scholar; b. in New York city, May 22, 1821; graduated at the University of New York 1839; studied medicine and law; was admitted to the bar 1845; was associate editor of the New York *Courier and Enquirer* 1851–58; and subsequently, 1860–61, of the *World*; wrote largely for reviews and magazines, chiefly on music, Shakespeare, and social subjects, to which he added some essays on the English language; was the writer of the "Yankee Letters" in the London *Spectator* 1863–67, and for nearly twenty years was chief clerk of the U. S. revenue marine bureau in the district of New York, resigning in 1878. He was the author of *Biographical and Critical Handbook of Christian Art* (1853); *Shakespeare's Scholar* (1854); *The Authorship of the Three Parts of Henry VI.* (Cambridge, 1859); *National Hymns, a Lyrical and National Study for the Times* (New York, 1861); *The New Gospel of Peace* (4 parts, Cambridge, 1863–66); an anonymous political satire which acquired great celebrity; *Memoirs of the Life of William Shakespeare, with an Essay toward the Expression of his Genius, etc.* (Boston, 1865), an abridgment of which formed part of the first volume of his scholarly annotated edition of Shakespeare (12 vols., Boston, 1857–65); and *Words and their Uses* (New York, 1870). He appended notes to, but did not edit, Burton's *Book-hunter* (1866), and collected and edited *Poetry of the Civil War* (1866). In 1880 he published *Every-day English*, and also *The American View of the Copyright Question*; in 1881, *England Without and Within*, which has been generally accepted by British critics as one of the most correct and impartial views of English character and English life ever presented; in 1883, *The Riverside Shakespeare*, with biography, introductions, and notes (3 vols., Cambridge); in 1884, *The Fate of Mansfield Humphreys*, a novel. He was the author of a series of articles on the failure of the public-school system in the U. S. (1881) which provoked much controversy. A volume of *Studies in Shakespeare*, made up from his contributions to various periodicals and revised just before his death, was published in Boston in 1886. D. in New York city, Aug. 8, 1885.
Revised by W. J. Rolfe.

White, William, D. D.: bishop; b. in Philadelphia, Pa., Apr. 4, 1748, or according to some authorities, Mar. 24, 1747 or 1748; graduated at the College of Philadelphia 1765; studied theology in England; took orders in the Church of England 1770; was rector of Christ church and St. Peter's in Philadelphia 1779–1836; was chaplain to Congress when in session at York, Pa., 1777, and continued in his chaplaincy 1777–85 and 1789–1801; was a friend and pastor of Washington; presided at the first Episcopal convention held in America, Sept. and Oct., 1785; wrote the constitution of the Church then adopted; was chosen bishop of the diocese of Pennsylvania 1786; proceeded to England with his fellow bishop-elect (of New York), Dr. Samuel Provoost; was consecrated at Lambeth Palace chapel by the Archbishop of Canterbury Feb. 4, 1787, being the first American bishop in the line of succession from Canterbury; was president of the first Bible Society established in the U. S., and of several charitable institutions, and, with Bishop Seabury, of Connecticut, as the first "House of Bishops" of the American Church, revised the *Book of Common Prayer* for the use of the American Episcopal Church. Bishop White received holy baptism in Christ church, Philadelphia, May 25, 1748; there received his first communion; and there, May 28, 1787, his first ordination took place. In this church Bishop White consecrated six bishops for various sees. D. in Philadelphia, July 17, 1836. He was the author of *The Case of the Episcopal Churches in the U. S. considered* (1782); *Lectures on the Catechism* (1813); *Memoirs of the Protestant Episcopal Church in the United States* (1820; 3d ed. by Rev. B. F. De Costa, D. D., New York, 1880); and other works. A *Memoir*, by Rev. Dr. Bird Wilson, appeared in 1839. Revised by W. S. Perry.

White, William Henry, C. B., LL. D., F. R. S.: civil engineer and naval constructor; b. at Devonport, England, Feb. 2, 1845; educated at the Royal School of Naval Architecture; graduated head of his class in 1867; until 1883 was employed in the construction department; 1883–85 chief constructor Elswick works in charge of ship-building department; since 1885 director of naval construction to the admiralty and assistant controller of the navy; fellow of the Royal Societies of London and Edinburgh; vice-president of the Institute of Naval Architects; member of the Institution of Civil Engineers and the Iron and Steel Institute. He has published a *Manual of Naval Architecture*, a *Treatise on Ship-building*, and numerous memoirs and papers.

White Ants: See Termites.

Whiteaves, JOSEPH F.: See the Appendix.

Whitebait: a name given in England to small fishes which were long supposed to belong to a peculiar species (*Clupea alba*), and even to a special generic type (*Rogenia*) of the *Clupeidæ*, but which are now known to be merely the young of the common herring (*Clupea harengus*) and the sprat (*Clupea sprattus*). The differences in physiognomy and in dentition between the young and old of the *Clupeæ* are sufficient to have afforded some reasons for a distinction originally, especially in connection with the differences of habits. The name whitebait is limited to fishes which are under 6 inches in length and whose sides are almost uniformly white. Such fishes begin to make their appearance in the river Thames in England about the end of March or early in April, and during the summer months are caught in immense quantities.

White Bear: See BEAR and URSIDÆ.

White Bear Lake: village; Ramsey co., Minn.; on the White Bear Lake, and the St. Paul and Duluth Railroad; 12 miles N. by E. of St. Paul, 15 miles N. E. of Minneapolis (for location, see map of Minnesota, ref. 9–F). It is a summer resort, 920 feet above sea-level, in an agricultural and stock-raising region, does its banking in Minneapolis and St. Paul, and has a weekly newspaper. Pop. (1900) 1,288.

White Copper: an alloy, commercially called **Packfong**. See NICKEL and PAKTONG.

White Cross Society: See the Appendix.

Whitefield: town; Coos co., N. H.; on the Concord and Montreal and the Maine Cent. railways; 11 miles S. of Lancaster, 125 miles N. of Concord (for location, see map of New Hampshire, ref. 4–E). It contains the villages of Whitefield and Hazen's, and has 4 churches, high school, parochial school, public library, 5 hotels, a banking and trust company, several lumber-mills, an overall and shirt factory, tub and box factories, a bobbin-factory, a large fancy stock farm, and a weekly newspaper. Pop. (1880) 1,828; (1890) 2,041; (1900) 2,157. E. H. WESTON, EDITOR OF "NEWS."

Whitefield, GEORGE: preacher; b. at Gloucester, England, Dec. 16, 1714; son of an innkeeper, but the grandson and great-grandson of clergymen; in St. Mary's grammar school acquired the rudiments of learning, and there gave indications of extraordinary talent for public speaking. He entered the University of Oxford in his eighteenth year as a Pembroke servitor. Having become intimate with the Oxford Methodists, as certain pious students were called, and having undergone a great moral change, he resolved to devote himself to the ministry; was ordained June 20, 1736, in the choir of Gloucester Cathedral, and the following week he preached his first sermon there.

He went to London, at first to read prayers in the Tower chapel, but, having begun to preach at Bishopsgate church, his fame soon spread over the city, and shortly he was engaged four times on a single Sunday in addressing audiences of enormous magnitude. Having addressed multitudes in other parts of his native county, he spent some weeks in Bristol. His friends, the Wesleys, urged him to go to America, and in 1738 he visited Georgia, but returned the same year to raise funds for the needy colonists and to receive priest's orders. When again in the city of Bristol, he pondered what had been said to him there some time before—"What need of going abroad? Have we not Indians enough at home? If you have a mind to convert Indians, there are colliers enough in Kingswood." He hasted to Kingswood, as he says, and preached before immense audiences with such power that "hundreds and hundreds of them were soon brought under deep conviction, which, as the event proved, ended in a sound and thorough conversion." Then he visited Wales with Howell Harris, and, beginning at Cardiff, proceeded from town to town, laboring in every place with all his accustomed ardor. The effects produced were very striking, and an excitable people, as were the inhabitants of the principality, yielded to the force of the preacher's appeal and to the power of those divine truths which he proclaimed. In Aug., 1739, he sailed again for America, preached at Philadelphia, New York, and other places; established an orphanage at Savannah; and in 1740 visited New England, where his preaching was highly successful, but met with bitter opposition from some of the clergy. In 1741 he returned to England.

At length a dispute arose between Whitefield and Wesley. The tide for a time turned against the former, "and at Kennington Common," he says, "I had not above a hundred to hear me." He had to begin his work afresh, and was encouraged by Beza's words: "Calvin is turned out of Geneva, but, behold, a new Church arises!" On a common near Braintree he preached to 10,000. Then he went to Scotland, but the churches would not hold the congregations. He continued preaching, always twice, often thrice, and once seven times, a day. We find him in Gloucestershire, and again in Wales, and once more in London. He returned to Scotland, caused a wonderful revival at Cambuslang, and then reappeared in London, having traversed the kingdom, preaching wherever he went.

In 1744 Whitefield sailed to America for the third time. In 1748 he recrossed the Atlantic, and was sent for by the Countess of Huntingdon to preach in her drawing-room to the nobility, among whom were Chesterfield and Bolingbroke. Scotland was revisited; so was the west of England. From Bristol he writes: "Yesterday God brought me here after having carried me a circuit of about 800 miles, and enabled me to preach to upward of 100,000 souls." Immense consternation was caused in London by an earthquake in Mar., 1750; people thought the world was coming to an end. Whitefield addressed a multitude in Hyde Park, telling them God's true prophecy of the world's end. Afterward he visited Ireland and Scotland, and then a fourth time crossed the ocean. We find him in England again before the year's end, and, after preaching there, hasting once more to the other side of the Tweed. The Tabernacle and Tottenham Court chapels were built in 1753 and 1756, and there he gathered crowded congregations. Again and again he repeated his visits to Scotland, filling up the intervals with home engagements. He went to America a fifth, a sixth, and a seventh time. He preached every day at Boston from Sept. 17 to 20, 1770; then traveled to Newburyport, preaching two hours at Exeter, N. H., Sept. 29, on the way. He went that evening to Newburyport, Mass., where he died the next day (Sunday), Sept. 30, 1770.

Whitefield's intellectual powers were not of a high order, but he had an abundance of that ready talent which makes the popular preacher; and beyond all natural endowments there was in his ministry the power of evangelical truth, and, as his converts believed, the presence of the Spirit of God. His voice was marvelously varied, and he ever had it at command—an organ, a flute, a harp, all in one.

His works, with a memoir, by J. Gillies, have been published in 7 vols. (London, 1771–72). Among the *Lives* are those by Philip (1837), Andrews (1864), and Tyerman (2 vols., London, 1876–77; 2d ed. 1890). The best description of Whitefield's personal peculiarities is in Rev. W. Jay's *Memoirs of Cornelius Winter*. Revised by J. F. HURST.

Whitefish: any fish of the family *Salmonidæ* and genus *Coregonus*. These have the form essentially similar to that of the salmons and trouts, although less graceful, and with a stouter tail; the scales are also larger, but are of moderate size; the mouth has a narrow cleft, and the upper jaw projects more or less beyond it, or is truncated; the maxillary bones are short and broad; the teeth are wanting or extremely minute; the suborbital bones are well developed; the dorsal fin has thirteen to fifteen rays, the anal thirteen to sixteen; the adipose dorsal fin is moderately developed; the stomach recalls a horseshoe by its form; the pyloric appendages are very numerous. The species are generally distributed in the colder waters of the northern hemisphere, especially affect the still waters of lakes and ponds, and are rather local in their distribution. About thirty species are known, distributed between Europe, Asia, and North America. Among the most notable of the American species is the *Coregonus albus*, or common whitefish of the lakes, one of the most important of the economical fishes of the great system of northern lakes. Extensive warehouses exist for its storage in and near the large cities and towns on the lake borders. See FISHERIES.

White Flux: a mixture of potassium carbonate, nitrite, and nitrate. See FLUX.

Whitefriars: an ancient precinct in London, between Fleet Street and the Thames, deriving its name from the church of the Carmelite monks, or "White Friars," founded by Sir Richard Grey in 1241. It also bore the cant name of Alsatia. Salisbury Court, Whitefriars, enjoyed for centuries the privileges of a sanctuary—at first for criminals, and subsequently for debtors only—until 1697. Whitefriars theater was a flourishing institution during most of the dramatic career of Shakespeare (1580–1613), but was pulled down at the latter date.

White Hall: city; Greene co., Ill.; on the Burlington Route and the Chi. and Alton railways; 24 miles S. by W. of Jacksonville, 65 miles N. of St. Louis (for location, see map of Illinois, ref. 7–C). It is in an agricultural region, with an abundance of coal and potter's clay in the vicinity, and has Baptist, Christian, Methodist Episcopal, Presbyterian, and Roman Catholic churches, high school, school property valued at $25,000, 2 private banks, a daily and 2 weekly papers, electric-light plant, and manufactories of stoneware, sewer-pipe, flour, and machinery. It is an important shipping-point for live stock. Pop. (1880) 1,716; (1890) 1,961; (1900) 2,030. EDITOR OF "EVENING REPUBLICAN."

Whitehall: village (incorporated in 1867); Muskegon co., Mich.; on White Lake, and the Chi. and W. Mich. Railway; 5 miles from Lake Michigan, 16 miles N. W. of Muskegon, the county-seat (for location, see map of Michigan, ref. 7–H). It is in an agricultural and lumbering region; is a popular summer resort; contains a graded public school, a savings-bank with capital of $25,000, tannery, several shingle and lath mills, bicycle-factory, wagon-factory, and many summer residences of Chicago and Grand Rapids business men; and has a weekly newspaper. Pop. (1880) 1,724; (1890) 1,903; (1900) 1,481. EDITOR OF "FORUM."

Whitehall: village; Washington co., N. Y.; on Lake Champlain, Poultney river, the Champlain Canal, and the Del. and Hud. Railroad; 24 miles W. by S. of Rutland, Vt., 76 miles N. by E. of Albany (for location, see map of New York, ref. 3–K). It is in a ravine at the foot of Skene's Mountain; has a union free school with library, 2 national banks with capital of $150,000, gas and electric-light plants, and 2 weekly newspapers; and has excellent water-power, several shipyards, silk and knitting mills, grist-mills, saw and moulding mills, railway-shops, and minor industries. The village has a large lumber trade. Pop. (1880) 4,270; (1890) 4,434; (1900) 4,377. EDITOR OF "CHRONICLE."

Whitehaven: town; county of Cumberland, England; on the Irish Sea, near the entrance of the Solway Frith; 41 miles S. W. of Carlisle (see map of England, ref. 4–E). It is well built, finely situated, and has a good harbor, with a wet dock of 5 acres, two piers, each over 300 yards long, and a lighthouse. It has manufactures of sailcloth, soap, earthenware, and cordage, iron-smelting works and foundries, and exports large quantities of coal from the rich collieries in its neighborhood. Whitehaven returns one member to Parliament. Pop. (1891) 18,044.

White Haven: borough (founded about 1825, incorporated in 1843); Luzerne co., Pa.; on the Lehigh river, and the Lehigh Val. and the Cent. of N. J. railways; 25 miles N. of Mauch Chunk, 30 miles S. E. of Wilkesbarre (for location, see map of Pennsylvania (ref. 3–H). It has seven churches, complete system of graded public schools, Roman Catholic parochial school, a State bank with capital of $25,000, and a weekly newspaper. It was for many years, and till the timber was exhausted, the principal seat of the vast Lehigh lumber interests; now it is principally engaged in agriculture and manufacturing. Pop. (1880) 1,408; (1890) 1,634; (1900) 1,517. EDITOR OF "JOURNAL."

Whitehead, WILLIAM: poet; b. at Cambridge, England, in 1715; educated at Winchester School and at Clare Hall, Cambridge, where he became fellow 1742; wrote the tragedies *The Roman Fathers* (1750) and *Creusa, Queen of Athens* (1754); a comedy, *The School for Lovers* (1762); a farce, *The Trip to Scotland* (1770), and a number of minor poems, which procured him the honor of being appointed poet-laureate on the death of Cibber (1757). He resided many years in the family of Lord and Lady Jersey, first as tutor to their son, whom he accompanied 1754–56 on a European tour, and obtained in 1755, through Lady Jersey, the post of secretary and registrar of the order of the Bath. D. Apr. 14, 1785. Revised by H. A. BEERS.

White House: the residence of the President of the U. S. See WASHINGTON.

White Lead: See LEAD.

Whitelocke, BULSTRODE: politician; b. in London, England, Aug. 2, 1605; studied at St. John's College, Oxford; sat in the Parliament of 1626 and was called to the bar in that year. He was elected to the Long Parliament 1640, and acted with the Parliamentary party, but always so prudently as to guarantee his safety if the Cavaliers should triumph. He was chairman of the committee for conducting the impeachment of the Earl of Strafford 1640–41, but tried to avert civil war, and was one of the Parliamentary commissioners to treat with Charles I. at Oxford. He opposed the Self-Denying ordinance; was a commissioner of admiralty 1645; was a member of the commission sent to Uxbridge to negotiate a treaty of peace 1645; was one of the commissioners of the great seal 1649, but refused to take part in the trial of the king, which he disapproved; was appointed ambassador to negotiate a treaty with Queen Christina of Sweden Sept., 1653; became a commissioner of the treasury 1655, and Speaker of the House of Commons 1656; was commissioner of the great seal to Richard Cromwell, and president of the council of state during the interregnum. He accepted the Restoration and was included in the Act of Oblivion, but afterward took no active part in politics. D. at Chilton, Wiltshire, in 1675. He left in MS. an autobiography and several other works, among which are his *Memorials of English Affairs, or an Historical Account of what passed from the Beginning of the Reign of King Charles I. to the Restoration of King Charles II.* (1682; reprinted in 1732 and 1852) and a *Journal of the Embassy to Sweden* (1772; edited by H. Reeve, 1855).

White Mountains: a group of peaks in Northeastern New Hampshire, usually regarded as forming a part of the Appalachian system. They rise boldly from a deeply eroded plateau and are drained by several clear, swift streams. Of these the most important are the Saco, flowing S. E. across the southern portion of Maine to the Atlantic, and the Pemigewasset and Ammonoosuc, which find their way westward to Connecticut river. Several of the higher peaks in the eastern portion of the range have been named in honor of Presidents of the U. S. For this reason the name Presidential Range is applied to them. The western portion of the group is known as the FRANCONIAN MOUNTAINS (*q. v.*). The White Mountains culminate in Mt. Washington which, as determined by the U. S. Signal Service, has an elevation of 6,286 feet, and with the exception of Mt. Mitchell, North Carolina, 6,688 feet high, is the highest point in the U. S. east of the Mississippi. The heights of several splendid peaks grouped about Mt. Washington have been ascertained by the Appalachian Club. The more prominent of these are Mt. Adams, 5,819 feet; Mt. Jefferson, 5,736 feet; Mt. Madison, 5,381 feet; Mt. Clay, 5,554 feet; Mt. Monroe, 5,396 feet. There are, besides, many peaks of less prominence, all of which are forest-covered, rugged, and picturesque. Of the Franconian group the only one exceeding 5,000 feet is Mt. Lafayette, 5,269 feet high. The area of the entire group may be taken at about 800 sq. miles. A station of the U. S. Weather Bureau has been maintained on the summit of Mt. Washington since 1871.

Since early in the nineteenth century the White Mountains have been much visited by tourists and seekers after health. For many years access was had to them by means of stage-coaches, but in time the railway came, and a through line from Portland extends through Crawford Notch, bisecting the range and connecting on the west with several trunk railways. Not the least remarkable of the sights of this region is the railway by which a locomotive with cars attached climbs Mt. Washington, rising 3,625 feet in 3 miles. See T. Starr King, *The White Hills, their Legends, Landscape, and Poetry* (Boston, 1839; new ed. 1887); and Julius H. Ward, *The White Mountains* (New York, 1890), with a bibliography. ISRAEL C. RUSSELL.

White Nun: See SMEW.

White Plains: village; capital of Westchester co., N. Y.; on the N. Y. Cent. and Hud. River Railroad; 22 miles N. E. of New York (for location, see map of New York, ref. 8–J). It is the new seat of the Bloomingdale Asylum for the Insane (cost $2,000,000, opened in 1894), and contains the county court-house, new Hall of Records, Alexander Institute (Presbyterian, opened in 1845), Institute, Lyceum, and Westchester County Law Libraries, 2 public-school buildings, 2 private schools, 2 State banks with combined capital of $150,000, and a savings-bank. There are 3 weekly newspapers. The village was the scene of a battle Oct. 28, 1776, in which the British under Gen. Howe drove the Americans from Chatterton Hill, W. of Bronx river, with a loss to the latter of 180 killed, wounded, and prisoners. Pop. (1880) 2,381; (1890) 4,042; (1900) 7,899. EDITOR OF "WESTCHESTER NEWS."

White River: a stream that rises by several heads in the Ozark Hills in Northwestern Arkansas, takes a circuit of 100

miles in Missouri, returns to Arkansas, and after a course of some 900 miles reaches the Mississippi river at a point 15 miles above the mouth of the Arkansas, into which a part of its waters are discharged. It is navigable by large steamboats to Batesville, Ark., 380 miles.

White River: a stream in Indiana that rises by two forks. The east or Driftwood fork (called also Blue river), flowing from Henry County, is 250 miles long, and is navigated to Rockford. The west fork, the longer arm, rises in Randolph County, and crosses the State. It is 300 miles long, and is navigable at high water 150 miles to Martinsville. The main stream is 50 miles long, and flows into the Wabash.

White River Junction: village; Hartford town, Windsor co., Vt.; at the confluence of the Connecticut and White rivers, and on the Boston and Maine, the Cent. Vt., and the Woodstock railways; 14 miles E. of Woodstock, 64 miles S. by E. of Montpelier (for location, see map of Vermont, ref. 7–C). It is an important commercial distributing point, and has a public high-school, national bank with capital of $100,000, a savings-bank, and a weekly newspaper. Pop. (1880) 763; not returned separately in 1900.

Whitesboro: town (founded in 1848); Grayson co., Tex.; on the Mo. Kan. and Tex. and the Tex. and Pac. railways; 70 miles N. of Fort Worth (for location, see map of Texas, ref. 2–I). It is in an agricultural and stock-raising region, and has 5 churches, graded public school with over 400 pupils, and a weekly newspaper. Pop. (1880) 773; (1890) 1,170; (1900) 1,243. EDITOR OF "NEWS."

White Sea: a large inlet of the Arctic Ocean, penetrating into European Russia for a distance of 380 miles, with a breadth of from 30 to 150 miles. It is frozen from October to May, and is rich in herring and codfish.

Whitestone: village; Queens co., N. Y.; on Long Island Sound, and the Long Island Railroad; now a part of the Borough of Queens, New York city (for location see map of New York, ref. 8–K). It has an excellent harbor, several summer hotels and boarding-houses, two weekly newspapers, and a number of tinware and other factories. Near by are Fort Schuyler, on Throgg's Neck, and the U. S. military post at WILLET'S POINT (*q. v.*), commanding the eastern entrance to New York harbor. Facilities for boating have made the village a popular summer resort. Pop. (1880) 2,520; (1890) 2,808; (1895) estimated, 3,200. EDITOR OF "HERALD."

White Sulphur Springs: city; capital of Meagher co., Mont.; on a stage line, 40 miles E. of the North Pac. Railroad; 65 miles E. by S. of Helena, the State capital (for location, see map of Montana, ref. 6–F). It is in an agricultural, stock-raising, and gold, silver, copper, and coal mining region; is a health resort, with thermal springs long noted for their curative properties; and has 3 churches, large graded school, a national bank with capital of $200,000, and 2 weekly newspapers. Pop. (1890) 640; (1900) 446.
EDITOR OF "ROCKY MOUNTAIN HUSBANDMAN."

White Sulphur Springs: See CHITTENANGO SPRINGS.

White Sulphur Springs: noted health resort in Greenbrier co., W. Va.; on the line of the Ches. and Ohio Railway; 91 miles W. of Staunton and 227 miles W. by N. of Richmond (for location, see map of West Virginia, ref. 10–H). It has a beautiful location, is within from 20 to 40 miles of the Hot, Sweet, Red, Salt, and Blue Sulphur Springs, and has been visited by whites since 1778. The temperature of the water is 62°, and the principal substances found in solution are nitrogen, oxygen, carbonic acid gas, hydrosulphuric acid, sulphates of calcium and magnesium, and carbonate of calcium, and the effect is alterative and stimulant. There are large swimming baths and numerous mud-baths. The locality is one of the most popular health and summer resorts in the South, and has large hotel and cottage accommodations. Pop. of district (1900) 1,625.

White Swelling: the popular name for a chronic inflammation of the joints. The disease is now recognized as a form of tuberculosis of the joints.

Whitethroat: the *Sylvia undata*, or *Curruca cinerea*, a very abundant European warbler whose song is rather sweet and very energetic. It is a favorite cage-bird, 5½ inches in length, colored reddish and whitish brown, with a throat of pure white. There are several other warblers called whitethroat in Great Britain.

White Walnut: See BUTTERNUT.

Whitewash: a preparation of slaked lime, thinned to a milky consistence, and used for whitening walls. Skimmed milk, glue, zinc sulphate, tallow, and various pigments are sometimes added. Some of them form insoluble compounds with lime, and thus add to the permanency of the wash.

Whitewater: city (incorporated in 1885); Walworth co., Wis.; on the Whitewater river, and the Chi., Mil. and St. P. Railway; 45 miles S. E. of Madison, 51 miles S. W. of Milwaukee (for location, see map of Wisconsin, ref. 7–E). It is in an agricultural, dairying, and stock-raising region; contains a State Normal School, a collegiate institute, a national bank (capital $125,000), and a State bank (capital $75,000), and has two weekly newspapers, several cheese-factories, furniture, sash, and door factories, paper-mill, wagon-factory, and other industries. Pop. (1880) 3,617; (1890) 4,359; (1900) 3,405. EDITOR OF "REGISTER."

Whitewater River: a stream in Indiana; formed by two forks (the east and west), which unite at Brookville. The stream enters Ohio, and joins the Great Miami 6 miles from its mouth. Length to source, 100 miles.

Whitewater River: a river in the S. E. of Missouri and the N. E. of Arkansas. It rises in St. Francis County, flows southward, receiving in Scott County an East Fork which rises in Cape Girardeau County, and joins the complicated lake and river system of the S. E. of Missouri. After a course of 250 miles its waters are for the most part discharged into St. Francis river in Arkansas.

Whiteway, Sir WILLIAM V.: See the Appendix.

White Whale: a small cetacean, the *Delphinapterus leucas*, belonging to the family *Delphinidæ*, common to all the northern seas, and on the eastern coast of North America extending southward at least as far as the Gulf of St. Lawrence, where it is quite abundant. The form is essentially similar to that of the common porpoise, but the head is rounded forward and the cervical region has somewhat of a contraction; no dorsal fin is developed, and hence the name *Delphinapterus*—i. e. porpoise without a fin; the color is a spotless white. These whales sometimes attain a length of 20 feet, or even more, but the average is perhaps about 13 feet. They frequently ascend a considerable distance up large rivers (e. g. the St. Lawrence). They often associate together in troops, but are also observed "in lines of seldom more than two or three abreast, or more frequently in single file, spouting irregularly," and showing little of the form above water. They are captured with harpoons and lances as well as in nets.

Whitewood: a name given in the U. S. to the wood of the TULIP-TREE (*q. v.*). The bark of *Canella alba* (see CANELLA ALBA) is called whitewood bark. Other whitewoods are *Pittosporum bicolor*, of Australia, etc., *Oreodaphne leucoxylon*, *Lagunaria pattersoni*, *Tabebuia leucoxylon*, and many other trees, mostly tropical.

Whitfield, HENRY: clergyman; b. in England in 1597; son of an eminent lawyer: received a university education, and studied law; took orders in the Church of England; was minister of Ockley, Surrey, where he sheltered a number of Puritan ministers during the persecution of Archbishop Laud, from which he ultimately suffered himself, in consequence of his refusal to read in church the *Book of Lawful Sunday Sports*; emigrated to New England with many of his old parishioners 1637; was one of the founders of Guilford, Conn. (1639), where his house, built in that year, and one of the oldest in the U. S., is still standing; made a liberal use of a handsome fortune, and was esteemed one of the chief founders of New Haven colony; returned to England 1650, and became minister at Winchester, where he died in 1658. He was the author of *Helps to Stir up to Christian Duties* (London, 1634); *The Light Appearing more and more towards the Perfect Day, or A Farther Discovery of the Present State of the Indians in New England, etc.* (1651; new ed. New York, 1865); and *Strength out of Weakness, or A Glorious Manifestation of the Further Progresse of the Gospel among the Indians in New England* (1652; new ed. New York, 1865).

Whitfield, ROBERT PARR, M. A.: paleontologist and geologist; b. near New Hartford, Oneida co., N. Y., of English parents, May 27, 1828; in 1835 went with his family to England, returning to the U. S. in 1841: learned the trade of spindle-making; had charge of the instrument department of a telegraph and philosophical instrument establishment, Utica, N. Y., for about eight years; assistant to James Hall, State geologist of New York, on the paleontological work of the State natural history survey 1856–77; teacher and afterward Professor of Geology and Paleontology in the

Rensselaer Polytechnic Institute, Troy, N. Y., 1872–77; curator of the geological department of the American Museum of Natural History, New York city, from 1877. His paleontologic work has consisted largely in the description and characterization of species, genera, and higher groups. Its chief results appear in the following publications: *Natural History of New York State, Reports on Palæontology* (issued since 1856); *United States Survey of Fortieth Parallel* (under Clarence King, vol. iv., part ii., in connection with Prof. Hall, 1877); *Palæontology*, in vol. ii. *Geological Survey State of Ohio*, several papers in association with Prof. Hall (published in 1875); *Geology of Wisconsin*, in vol. iv. *Palæontological Report* (prepared in 1877 and 1878; published in 1882); *The Black Hills of Dakota, Palæontology* (published 1880); *Geology of the State of New Jersey*, vol. i. *Palæontology*; *Cretaceous Fossils of New Jersey* (1885; issued by U. S. Geological Survey with co-operation of State of New Jersey); and *Bulletins of the American Museum of Natural History*, which are edited by him. Revised by G. K. GILBERT.

Whitgift, JOHN, D. D.: archbishop; b. at Great Grimsby, Lincolnshire, England, about 1530; educated at Queen's College and at Pembroke Hall, Cambridge, under Ridley and Bradford; was chosen a fellow of Peterhouse 1555; took orders in the Church of England; became chaplain to the Bishop of Ely, and rector of Feversham, Cambridgeshire, 1560; was appointed Lady Margaret Professor of Divinity 1563, Regius Professor of Divinity, master of Pembroke Hall and of Trinity College, Cambridge, all in 1567; became chaplain to Queen Elizabeth, prebendary of Ely 1568, vice-chancellor of Cambridge 1570, dean of Lincoln 1571, prebendary of Lincoln 1572, Bishop of Worcester and vice-president of the Marches of Wales 1577; succeeded Edmund Grindall as Archbishop of Canterbury 1583; showed himself intolerant both of Roman Catholicism and of Puritanism, managing the Star-Chamber prosecutions with great rigor; obtained a decree against liberty of printing June, 1585; became privy councilor 1586; founded a hospital and grammar school at Croydon 1595, and took part in the conferences at Hampton Court Jan., 1604. D. at Lambeth Palace, Feb. 29, 1604. His theological *Works* were edited for the Parker Society (Cambridge, 3 vols., 1851–54) by Rev. John Ayre. His *Life* was written by Sir George Paule (1612), by John Strype (1718), and in Hook's *Lives of the Archbishops of Canterbury*. Revised by S. M. JACKSON.

Whiting: the *Merlangus vulgaris*, a European fish of the family *Gadidæ* and related to the true codfishes. As in them, the body is moderately elongated and covered with small scales; the head conic; the mouth deeply cleft; the upper jaw longest; the teeth in bands in the upper and lower jaw and on the vomer, but absent on the palatines; the dorsals three and the anals two; it differs from the true codfishes especially in that no barbel is developed at the chin; the color above is very dark and almost black, and below grayish; a black spot is developed in the axil of the pectoral fin. The species is esteemed for the excellence of its flesh, which is said to surpass in delicacy that of any other representative of the family. It is quite common in the seas of Northern Europe, and is fished for throughout almost the entire year, but is more abundant in winter, when it approaches the shore—it is believed, to spawn. Its average size is about 12 or 16 inches, with a weight of 1½ lb., although it sometimes attains a weight of 3 or 4 lb. It is a voracious fish, and seizes indiscriminately any of the Mollusca, worms, small Crustaceæ, and young fishes. It appears to prefer sandy banks, but shifts its ground frequently in the pursuit of the various fry of other fishes, upon which it subsists. Although repeatedly claimed to be an inhabitant of the Atlantic coast, it has not yet been found thereon, the hake (*Merlucius bilinearis*) having been mistaken for it. On some parts of the coast the name "whiting" is also applied to the *Menticirrus nebulosus*, more generally known as the KINGFISH (*q. v.*).

Whiting: town; Lake co., Ind.; on Lake Michigan, and the Penn. Co.'s Railroad; 17 miles S. E. of Chicago (for location, see map of Indiana, ref. 1–B). It has a fine harbor, 5 churches, public and German Lutheran parochial schools, large oil refinery, a private bank, and 2 weekly newspapers, and is principally engaged in refining and shipping petroleum. Pop. (1880) 115; (1890) 1,408; (1900) 3,983.

Whiting, ARTHUR B.: See the Appendix.

Whiting, GEORGE ELBRIDGE: See the Appendix.

Whiting, WILLIAM HENRY CHASE: soldier; b. in Mississippi 1825; graduated at the U. S. Military Academy at the head of his class July 1, 1845, when appointed second lieutenant in the Corps of Engineers. Until 1853 he served in the construction of the defenses of Pensacola harbor, Florida, and Baltimore, Md., and in the improvement of rivers and harbors in Texas, of the defenses of San Francisco 1853–55; was in charge of the construction and repair of fortifications on the South Atlantic coast, and the improvement of various rivers and harbors in that section, including Cape Fear and Savannah rivers, 1856–61. He resigned his commission of captain of engineers Feb. 20, 1861, to join the Confederate service, in which he became a major-general, and commanded a division in 1863. Fort Fisher, at the mouth of Cape Fear river, was planned and constructed by him, and he was given command of it in 1864. He successfully defended it against the first attack under Gen. Benjamin F. Butler, but succumbed to Gen. Alfred H. Terry in Jan., 1865, when he was severely wounded and taken prisoner; was removed to Governor's island, New York harbor, where he died Mar. 10, 1865.

Whiting Pout: See BIB.

Whitling: See BULL-TROUT.

Whitlow, better known as FELON: a painful inflammation, ending in suppuration, of the tissues surrounding the phalangeal bones of the hands and feet. The last joint of the fingers is the most frequent situation. The immediate cause is probably always some injury, but certain forms of deterioration of the blood and general health predispose. The exact nature of the disease in question is abscess formation beneath the periosteum, the fibrous sheath surrounding the bone. There results from this a tense swelling of the finger or toe, with redness and local heat, and intense pain of a throbbing and later boring character. The intensity of the pain is due to the fact that the collection of pus is confined beneath the periosteum. In unfavorable cases, where no escape of the pus occurs spontaneously or as a result of incision, death of the bone, necrosis, may take place, and a loss of one or more joints not infrequently results. The treatment of felons should be early incision down to the bone. Poultices and anodyne lotions are poor substitutes for the radical procedure. WILLIAM PEPPER.

Whitman: town (incorporated in 1886); Plymouth co., Mass.; on the N. Y., N. H. and Hart. Railroad; 16 miles N. W. of Plymouth (for location, see map of Massachusetts, ref. 3–I). It contains the villages of Whitman, East Whitman (or South Abington Station), and Auburnville; has a high school, 19 district schools, public library, 6 churches, a savings-bank, and a weekly newspaper; and is principally engaged in the manufacture of boots, shoes, tacks, eyelets, wire nails, and boxes. The assessed valuation in 1894 was $3,342,560. Pop. (1880) 3,024; (1890) 4,441; (1900) 6,155.
EDITOR OF "TIMES AND COURIER."

Whitman, CHARLES OTIS, LL. D.: naturalist; b. at Woodstock, Oxford co., Me., Dec. 14, 1842; graduated at Bowdoin College 1868; studied at Leipzig, receiving the degree of Ph. D. in 1878, and in the same year was appointed Professor of Zoölogy in the Imperial University of Tokio. He returned to Europe in 1880, and studied at the Naples Zoölogical Station. Returning to the U. S. he served as assistant in zoölogy at Harvard University, carrying on with Alexander Agassiz some splendid researches upon the early development of the bony fishes. The years 1886–89 were spent in Milwaukee as director of a laboratory for the study of inland waters. In 1889 he was called to the head of the department of zoölogy in the Clark University, and in 1892 was given the head professorship of Zoölogy in the University of Chicago. Dr. Whitman has been the director of the Marine Biological Laboratory at Woods Holl, Mass., since its foundation in 1888. His writings are largely upon the structure and development of worms, and the development of the vertebrates. He has published *Methods of Research in Microscopical Anatomy and Embryology* (Boston, 1885); has been editor of the microscopical department of the *American Naturalist* since 1883; and established in 1887 the *Journal of Morphology*, the leading zoölogical periodical in America. J. S. KINGSLEY.

Whitman, SARAH HELEN (*Power*): poet; b. at Providence, R. I., in 1803; married in 1828 John Winslow Whitman, a lawyer at Boston, who died in 1833, after which she resided at Providence. She was the author of *Hours of Life, and other Poems* (1853); *Edgar Allan Poe and his*

Critics (1860); and, with her sister, ANNA MARSH POWER, of a volume of *Fairy Ballads* (revised ed. 1867–68). D. at Providence, June 27, 1878. A volume of her *Poems* was posthumously issued (Boston, 1879). She is best remembered for her friendship with Poe, to whom she was at one time engaged to be married. Revised by H. A. BEERS.

Whitman, WALT: poet; b. at West Hills, Long Island, N. Y., May 31, 1819. He was a son of Walter Whitman and Louisa Van Velsor. The father was of English, the mother of Dutch descent. While the poet was yet a child the family moved to Brooklyn, where the father worked at his trade of carpentering, and where young Whitman attended common school till he was thirteen years old. He then went into a printing-office and learned to set type. At the age of sixteen or seventeen, he taught a country school on Long Island, and began writing for newspapers and magazines. In 1839 and 1840 he edited and published at Huntington *The Long Islander*, a weekly newspaper. For the next ten or twelve years he was mainly employed in printing-offices as compositor, with an occasional contribution to periodical literature. It is during this period that he began studying the life of New York and Brooklyn, and familiarizing himself with all classes and conditions of men, and with all trades and occupations, going freely, as he says in his poems, "with powerful uneducated persons," making friends among working men, and giving full swing to his democratic proclivities. He occasionally appeared as a speaker at political mass-meetings both in New York and on Long Island, and was much liked. He made friends with pilots and stage-drivers, and spent much of his leisure time on the Brooklyn ferryboats and Broadway omnibuses. It is reported of him that about this period he drove a Broadway stage one whole winter that a disabled driver might lie off without starving his family.

In 1846–47 he became editor of the Brooklyn *Daily Eagle* newspaper, and was an occasional contributor to the *Democratic Review*. He also at this time wrote several novels, one of them called *Frank Evans*. When thirty years of age he set out on an extended tour through the Middle, Southern, and Western States, fetching up finally in New Orleans, where he tarried a year or more, finding employment as editorial writer on the *Crescent*. He returned to Brooklyn, and in 1850 started *The Freeman* newspaper as an organ of the Free-soilers, doing most of the writing himself.

From 1851 to 1854 he worked at his father's trade of carpentering, building and selling moderate-sized houses. The conception of his *Leaves* began to shape itself in his mind during this period. He frequently stopped work to write his poems. In the spring of 1855 the first issue of the *Leaves* appeared, a small quarto of ninety-four pages. A second issue, with many additions, appeared in 1856. The third edition was published in 1860 in Boston. In 1862 Whitman left Brooklyn and became a volunteer nurse in the army hospitals in Washington and in Virginia, continuing his services till the close of the war and later, supporting himself at first by writing letters to *The New York Times*. He is said to have personally visited and ministered to over 100,000 sick and wounded Union and Confederate soldiers. From 1865 to 1873 he found employment as a Government clerk in Washington. His war poems, *Drum Taps*, appeared in 1866. His services in the army hospitals impaired his health, and in the beginning of 1873 he suffered a light stroke of paralysis. He shortly afterward moved to Camden, N. J., where he continued to live, health seriously impaired, till his death Mar. 26, 1892. He never married; he accumulated but little property, and was most of the time his own publisher. In person Whitman was over 6 feet in height, and of fine physical proportions. As a man he inspired very strong attachment among all classes. He is buried in a granite tomb of his own designing in a cemetery near Camden. His *Leaves of Grass*, the title under which he at last included all his poems, has probably excited more discussion and called forth more hostile criticism than any other literary production of the time in which its author lived. It is an unrhymed, unmeasured work of over 10,000 lines, in its form aiming only to follow the law of the innate forms of organic nature, and in its substance celebrating life, sex, comradeship, democracy, America, as they are illustrated by the poet's own personality and environment. Whitman's ambition was not merely to be a sweet and popular singer, his scheme looked to much more than that; he would be a prophet and law-giver of his country and time; he would rival in his day and land the character and office of the ancient teachers and seers. He deprecates any study of his work merely as literature or art, his final purpose being ethical and religious. His work has won high approval in Europe, but has been generally neglected or condemned by his own countrymen on account of its outspokenness, which in Massachusetts resulted in the authorities objecting to the sale of his *Leaves of Grass* "on the ground of immorality." Portions of *Leaves of Grass* have been translated into various European languages. Since his death three books have appeared in England mainly devoted to him, to wit, *Walt Whitman*, by William Clarke; *Browning and Whitman, a Study of Democracy*, by Oscar L. Triggs; and *Walt Whitman, a Study*, by John Addington Symonds. In 1883 a *Life* of Whitman was published by Dr. R. M. Bucke, of London, Canada. Various editions of his *Leaves* have appeared from time to time since 1870; the final edition, being prepared by the author a few weeks before his death, was published in Philadelphia in 1893. Whitman's prose works are included in a volume called *Specimen Days and Collect*, published in 1883. His *Democratic Vistas* and *Hospital Memoranda* are in this volume.

JOHN BURROUGHS.

Whitney, ADELINE DUTTON (*Train*): author; b. at Boston, Mass., Sept. 15, 1824; married at the age of nineteen to Seth D. Whitney, of Milton, Mass., where she has since resided; has long been a favorite contributor to magazines, especially those for the young. She is the author of *Footsteps on the Seas, a Poem* (Boston, 1857); *Mother Goose for Grown Folks* (New York, 1860; revised eds. Boston, 1870, 1882); *The Boys at Chequasset* (Boston, 1862); *Faith Gartney's Girlhood* (1863); *The Gayworthys, a Story of Threads and Thrums* (1865); *A Summer in Leslie Goldthwaite's Life* (1866); *Patience Strong's Outings* (1868); *Hitherto, a Story of Yesterday* (1869); *Real Folks* (1872); *Pansies*, verse (1872); *The Other Girls* (1873); *Sights and Insights* (1876); *Bonnyborough* (1885); *Homespun Yarns* (1887); *Bird Talk*, verse (1887); *Daffodils*, verse (1887); and other works. Revised by H. A. BEERS.

Whitney, ASA: manufacturer and inventor; b. in Townsend, Mass., Dec. 1, 1791. After working in his father's blacksmith-shop and learning the trade he worked in Swansea, N. H., on cotton-mill machinery for two years or more; in 1813 removed to Brattleboro, Vt., and engaged in the same business, but was burned out and lost all his savings; removed to Brownsville, Jefferson co., N. Y., and for the next twelve years, in company with U. Walton, manufactured cotton machinery, nails, etc.; in 1826–30 made the machinery for a cotton-mill and engaged in the manufacture of cotton goods, but was unsuccessful; in 1830 was appointed master-machinist in the Mohawk and Hudson Railway shops, and in 1833 became superintendent of the road. In 1839 he was appointed a canal commissioner of the State of New York, and served two years, having charge of the Champlain Canal and the eastern division of the Erie Canal. In 1842 he removed to Philadelphia, and became a partner with Matthew Baldwin in the manufacture of locomotives; four years later devoted his energies to the work of perfecting car-wheels by a new process, and in 1848 began their manufacture on a large scale. Using only the best qualities of iron, testing the wheels at every stage, and annealing them thoroughly by a process of his own invention, it was soon found that these car-wheels were not liable to breakage, and were practically indestructible. The manufacture constantly increased, and for some years previous to his death about 75,000 wheels were produced annually. D. in Philadelphia, June 4, 1874. He was a man of great benevolence, and at his death left $50,000 to found a chair of dynamical engineering in the University of Pennsylvania.

Whitney, ELI: inventor; b. in Westboro, Mass., Dec. 8, 1765; graduated at Yale College 1792; went to Georgia; studied law while residing in the family of the widow of Gen. Nathanael Greene, by whom he was stimulated to devise a machine for cleaning seed-cotton, in which he succeeded, having invented the cotton-gin; suffered much from violence and fraud, the idea of his invention having been stolen by others, but formed a partnership with a Mr. Miller and commenced the manufacture of the machines near the town of Washington, Ga., in 1795; was voted by the Legislature of South Carolina a sum of $50,000 for his invention, which he succeeded in collecting only after many years of litigation; received a percentage for five years upon the use of his gins from the State of North Carolina, and was promised the same by Tennessee, but without

results; turned his attention to the manufacture of firearms, entering into a contract with the U. S. Government 1798, and reaped a fortune from his various improvements in their manufacture, which rapidly increased and became the origin of the flourishing village of Whitneyville, Conn. D. at New Haven, Conn., Jan. 8, 1825.

Whitney, James Amaziah, M. A., LL. D.: lawyer and author; b. at Rochester, N. Y., June 30, 1839; received a common school education; in 1868 became editor of a weekly publication, the *American Artisan*, and was elected the first president of the New York Society of Practical Engineering; in 1870 became Professor of Agricultural Chemistry in the American Institute. In 1872 he established himself as a solicitor of U. S. and foreign patents, and in 1876 was admitted to practice in the U. S. circuit courts. His writings have related largely to the law of patents for inventions, to questions of public policy, and to international law. In addition he has published *The Chinese and the Chinese Question* (1880; enlarged ed. 1888), in which he advocated the exclusion of the Chinese; *Notes of Travel in Western Europe*; and several volumes of poems. A collective edition of his poetical works was issued in 1886.

Whitney, Josiah Dwight, LL. D.: geologist; brother of Prof. William D. Whitney; b. at Northampton, Mass., Nov. 23, 1819; graduated at Yale College 1839; was for many years employed on State and national geological surveys, including Ohio, the Lake Superior region, Mississippi, and California, where he was (1860–74) State geologist; has been since 1865 Sturgis-Hooper Professor of Geology in Harvard University, and is a prominent member of the American Association and of the National Academy of Sciences. He was the author of *The Metallic Wealth of the United States* (Philadelphia, 1854); *A Report on the Upper Mississippi Lead Region* (1862); *The Geological Survey of California* (1864–70); and *The Yosemite Guide-book* (1869); translated *Berzelius on the Blowpipe* (1845); was joint author with Prof. John W. Foster of a *Report on the Geology of the Lake Superior Land District* (1851–52), and with Prof. James Hall of a *Geological Report on Ohio* (1858). Mt. Whitney, the highest peak of the Sierra Nevada, was named in his honor. D. Aug. 19, 1896. Revised by C. H. Thurber.

Whitney, William Collins, LL. D.: lawyer; b. at Conway, Mass., July 5, 1841; graduated at Yale College in 1863 and at the Harvard Law School in 1864, and soon after began the practice of law in New York city. He was made inspector of the city schools in 1872, and in the same year failed of election as the candidate of the Reformed Democracy for district attorney; was appointed corporation counsel in 1875, and reappointed in 1876 and 1880, resigning in 1882; U. S. Secretary of the Navy 1885–89, his administration being marked by the completion of several vessels that formed the nucleus of a modern U. S. navy.

Whitney, William Dwight: philologist; b. at Northampton, Mass., Feb. 9, 1827; entered the sophomore class of Williams College in 1842; graduated 1845; teller in a bank at Northampton 1845–49, devoting his leisure time chiefly to amateur studies in natural history; during the summer of 1849 was assistant of the U. S. Geological Survey; in the autumn of 1849 went to Yale College to pursue, under the instruction of Prof. E. E. Salisbury, the study of Sanskrit, which he had begun by himself in the preceding year. In 1850–53 he spent three winter semesters at the University of Berlin, studying with Weber, Bopp, and Lepsius, and two summer semesters with Roth at Tübingen. In 1851 he began, in association with Roth, preparations for an edition of the *Atharvaveda*, the first volume of which appeared in 1855–56. The second volume, with which the last years of his life were occupied, was nearly completed at the time of his death, and will receive final revision at the hands of his pupil, Prof. C. R. Lanman. He was appointed in 1854 Professor of Sanskrit in Yale College, and retained this position down to the time of his death, coupling with it during most of his life instruction in comparative philology and in German. From 1857 to 1884 he was corresponding secretary of the American Oriental Society, and from 1884 to 1890 its president; during all this time he was its chief spirit and the leading contributor to its *Journal*. He was also the first president of the American Philological Association (1869–70), and was represented by an article in nearly every one of the first sixteen volumes of the *Transactions* of the society. His work is characterized by rigid faithfulness to facts, a clearness and simplicity of statement that comes from a complete mastery of the material, and a sobriety of judgment and general good sense that have their basis in perfect sanity of mind. His greatest achievement was in the field of Sanskrit. Here, besides the above-mentioned edition of the *Atharvaveda*, his leading works are *Sanskrit Grammar* (1879; Germ. trans. 1879; 2d ed. 1889); *Supplement to Sanskrit Grammar: the Roots, Verb-forms, and Primary Derivatives* (1885); *Alphabetisches Verzeichniss der Versanfänge der Atharva-Samhita* (1857); *Atharva-veda-Prātiçākhya* (text, trans., notes, 1862); *Tāittirīya-Prātiçākhya* (1871)—for this awarded the Bopp premium by Berlin Academy: *Index Verborum* to *Atharvaveda* (1881). Among his contributions to the general science of language may be mentioned *Language and the Study of Language* (1867); *Life and Growth of Language* (1875); *Oriental and Linguistic Studies* (2 vols., 1873–74). He was editor-in-chief of *The Century Dictionary*, and prepared or supervised the preparation of a number of books intended for school use, such as a German dictionary, grammar, and reader, French grammar, etc., and *Essentials of English Grammar* (1877), which last has been of great service in dislodging the erroneous conceptions of language implied in the statements of the traditional grammar. D. at New Haven, June 7, 1894. For a sketch of his life, see *Atlantic Monthly*, March, 1895. Benj. Ide Wheeler.

Whitney, Mount: a mountain in Southeastern California, has an elevation of 14,522 feet, and is the highest peak in the U. S., not including Alaska. Its eastern slope is exceedingly precipitous, and rises nearly 11,000 feet above Owens valley, which skirts its base. The summit was occupied by Prof. S. P. Langley in 1881 for the purpose of making observations on solar heat. Israel C. Russell.

Whitsitt, William Heth: See the Appendix.

Whitsunday, or **Whitsuntide**: See Pentecost.

Whittaker, James Thomas, M. D., LL. D.: clinician; b. in Cincinnati, O., Mar. 3, 1843; graduated M. D. at the Medical College of Ohio in 1865: in the same year was appointed acting assistant surgeon in the U. S. navy; was Professor of Physiology in his *alma mater* 1870–80, and Professor of Theory and Practice of Medicine 1880–94; was lecturer on pathology to the Good Samaritan Hospital, Cincinnati, from 1870 to 1880, and on clinical medicine 1880–92. His principal works are *Lectures on Physiology* (1879); *History of Tuberculosis* (1887); *Theory and Practice of Medicine* (1893).

Whittemore, Thomas, D. D.: editor and author; b. in Boston, Mass., Jan. 1, 1800; was successively apprenticed to a morocco-dresser, a brass-founder, and a boot-maker; studied theology under Rev. Hosea Ballou; preached to Universalist churches in Milford 1821 and Cambridgeport 1822–31; settled at Cambridge; was joint editor of the *Universalist Magazine*, sole editor and proprietor for nearly thirty years from 1828 of its successor, *The Trumpet*; sat repeatedly in the Massachusetts Legislature, and was president of the Vermont and Massachusetts Railroad. D. at Cambridge, Mar. 21, 1861. He was the author of *The Modern History of Universalism* (Boston, 1830; enlarged ed. 1860); *Notes and Illustrations of the Parables of the New Testament* (1832); *Songs of Zion* (1836); *A Commentary on the Revelation of St. John* (1838); *A Plain Guide to Universalism* (1839); *The Gospel Harmonist* (1841); *Conference Hymns* (1842); *Sunday-school Choir* (1844); *Life of Walter Balfour* (1853); *Life of Rev. Hosea Ballou* (4 vols., 1854–55); an *Autobiography* (1859); and tracts in favor of Universalism. He edited Dr. Southwood Smith's *Illustrations of the Divine Government* (1831), with an *Appendix*. Revised by J. W. Chadwick.

Whittier, John Greenleaf: poet; b. in East Parish of Haverhill, Mass., Dec. 17, 1807, of Quaker parentage. He received a common school education, spending his boyhood on a farm. He was eighteen years of age when his first poem was published in William Lloyd Garrison's *Free Press*. He wrote the ode sung at the dedication of Haverhill Academy in 1827, and was thereafter a pupil in that institution for two terms, earning the means to pay for books and tuition in part by making slippers. At this time he wrote many verses for *The Haverhill Gazette* and other periodicals, few of which are preserved in any collection of his works. In Jan., 1829, he was called to Boston to edit *The American Manufacturer*, a political newspaper, and in August of the same year returned to Haverhill on account of the failing health of his father. He was editor of *The Haverhill Gazette* for the first six months of 1830. In July, 1830, he became

editor of the *New England Review*, a political paper of Hartford, Conn. While editing this journal he made a small collection of his poems and prose sketches which was published in Hartford Jan., 1831, entitled *The Legends of New England*. His principal ambition at this period was in the direction of political preferment, and he favored the policy of Henry Clay. He was appointed delegate from Connecticut to the national convention at Baltimore, called to nominate Clay for the presidency. Serious illness prevented his attending the convention and compelled him to resign the editorship of the *Review* in Jan., 1832. For several years thereafter he lived upon his Haverhill farm, a part of the time editing the *Gazette*. His poem *Moll Pitcher* was published anonymously in 1832. Early in 1833 he wrote an anti-slavery pamphlet, *Justice and Expediency*, and in December of that year was a delegate to the national anti-slavery convention in Philadelphia. He was secretary of the convention and on the committee with Garrison to draw up the "declaration of sentiments," which was the formal opening of the war upon the institution of slavery. He represented his native town in the Legislature of Massachusetts in 1835, and was re-elected to the next Legislature, but declined to serve on account of ill health. In 1836 he sold his farm and removed with his mother and sister to Amesbury, Mass., where he resided to the close of his life. His poem *Mogg Megone* was published in a miniature volume in 1836, this being the first book exclusively of verse that appeared with his name upon its title-page. In 1837 a collection was made of his anti-slavery poems, entitled *Poems written during the Progress of the Abolition Question in the United States between the Years 1830 and 1838*. He spent a few months in 1837 in New York, acting as one of the secretaries of the American Anti-Slavery Society. In 1838–40 he was editing the *Pennsylvania Freeman* in Philadelphia. His office was sacked and burned by a mob in May, 1838. A collection of his poems was published in Philadelphia by Joseph Healy in the same year. He returned to his Amesbury home in 1840, and in addition to the spirited lyrics with which for several years he endeavored to arouse the conscience of the people of the U. S. in the matter of slavery, he occasionally sent out ballads, exquisitely sweet and simple, illustrating many phases of New England life and character. These ballads were collected in 1843 in a volume entitled *Lays of my Home*, published in Boston, and this collection was the first book from which he derived any pecuniary benefit. He was on several occasions candidate for Congress of the Liberty party, but declined the position in 1843, when there seemed to be a prospect of being elected. In 1844–45 he edited *The Middlesex Standard*, Lowell, Mass., and for this paper wrote a series of prose articles which were in 1845 published in Boston under the title of *The Stranger in Lowell*. In 1846 a collection of his anti-slavery poems, *Voices of Freedom*, was published in Philadelphia. He was corresponding editor of *The National Era*, published in Washington, for thirteen years (1847–60), contributing to it many poems and prose articles. Several volumes were compiled from these writings—viz., *Leaves from Margaret Smith's Journal*, an imaginary description of New England in early times (Boston, 1849); *Old Portraits and Modern Sketches* (Boston, 1850); *Literary Recreations and Miscellanies* (Boston, 1854); *Songs of Labor* (Boston, 1850). A little volume entitled *The Supernaturalism of New England*, dealing with the superstitious beliefs of the people, was published in New York in 1847, and republished in the same year in London. Other works of this period were *Poems*, a complete collection, illustrated by H. Billings (Boston, 1849); *A Sabbath Scene*, satirizing the fugitive-slave law, illustrated (Boston, 1853); *The Panorama* (Boston, 1856); *Poetical Works*, blue-and-gold edition (2 vols., Boston, 1857); *Home Ballads, Poems, and Lyrics* (Boston, 1860); *In War Time* (Boston, 1863). When *The Atlantic Monthly* was started in 1857 he became one of its principal contributors, and thereafter to the end of his life much of his best work appeared in that periodical. In 1866 was published his poem *Snow Bound*, a graphic picture of an isolated New England homestead in winter, in which are many fine touches delineating each member of the family in which his youth was spent. The great popularity of this poem gave him at once a pecuniary independence he had not before enjoyed. Then followed *The Tent on the Beach* (1867); *Among the Hills* (1869); *Miriam* (1871); *The Pennsylvania Pilgrim* (1872); *Mabel Martin* (1874); *Hazel Blossoms*, including poems by his sister (1875); *Vision of Echard* (1878); *The King's Mission* (1881); *The Bay of Seven Islands* (1883); *St. Gregory's Guest* (1886); *At Sundown* (1892). Assisted by Lucy Larcom, he edited a collection of poems entitled *Child Life* (1871); *Child Life in Prose* (1874); and an anthology, *Songs of Three Centuries* (1876). During all his life he had a deep interest in public affairs, and took pains to make his influence felt in shaping the policy of his party. He was a member of the electoral college of Massachusetts in 1860 and 1864. He was never married. After the death of his sister, in 1864, a niece had charge of his household until her marriage in 1876. He then spent some months of each year, for the remainder of his life, with relatives at Oak Knoll, Danvers, retaining, however, his residence at Amesbury. He died at Hampton Falls, N. H., Sept. 7, 1892. A complete collection of his writings in prose and verse, which had received his careful revision and annotation, was published in Boston in 1888. It comprises four volumes of poems and three of prose, and is known as the "Riverside" edition. He will be longest remembered, perhaps, for his descriptions of natural scenery, touching the heart by the simplicity and tenderness with which he recounted the scenes and friendships of his youth, and quickened the religious spirit by giving poetical expression to the highest and holiest aspirations. The catholicity of this Quaker's faith is illustrated by the fact that his verses fill a large place in the collections of hymns for public worship in use in many different Christian denominations. In 1895 his complete poetical works were published in a single volume known as the "Cambridge" edition, and this volume includes all his latest verses, besides some fragments found among his papers. The same matter is arranged in a *Handy Volume* edition of four volumes.

Whittier's biographies have the following titles and dates: *John Greenleaf Whittier: his Life, Genius, and Writings*, by W. Sloane Kennedy (Boston, 1882); *John Greenleaf Whittier, a Biography*, by Francis H. Underwood (Boston, 1884); *John G. Whittier, the Poet of Freedom*, by W. Sloane Kennedy, in "American Reformers" Series (Boston, 1892); *A Memorial of John G. Whittier, from his Native City*, published by authority of the city council of Haverhill (1893); *Life of John Greenleaf Whittier*, by W. J. Linton (London, 1893); *Whittier: Notes of his Life and his Friendships*, by Mrs. James T. Fields (New York, 1893); *Personal Recollections of John G. Whittier*, by Mary B. Claflin (New York, 1893); *Life and Letters of John Greenleaf Whittier*, by Samuel T. Pickard, in two volumes, illustrated (Boston, 1894). SAMUEL T. PICKARD.

Whittington, Sir RICHARD: b. at Pauntley, Gloucestershire, England, about 1350; younger son of Sir William de Whityngdon, lord of the manor of Pauntley, who died 1360. Richard was obliged to seek his living, and, according to a well-known legend, walked to London and was apprenticed there to a merchant. At one time, however, he started to run away, but while seated at the foot of Highgate Hill, seemed to hear in the chime of Bow Bells—

> Turn again, Whittington,
> Thrice lord mayor of London.

He then returned, and later married Alice Fitzwarren, daughter of his employer; became a wealthy merchant, his first capital having been derived from the sale of a cat in an Eastern market; was lord mayor of London 1397, 1406, and 1419; carried on the business of a mercer; made loans to Henry IV. and Henry V.; bought on the Continent the wedding trousseaux for the Princesses Blanche and Philippa, of which the invoices are still in existence and died in 1423. Having no children, he left his large estate to public or charitable objects, among which were the rebuilding of Newgate prison, the founding of a college and of the libraries at Guildhall and of the Grey Friars, and the repair of St. Bartholomew's Hospital. He shared with Richard Harweden the expense of rebuilding the nave of Westminster Abbey, and during his magistracy ordered the compilation of a sort of directory of the city of London, containing curious accounts of its mediæval customs and privileges. This work, called the *Liber Albus* (or White Book), was written in 1419, in Latin and Anglo-Norman, by John Carpenter, common clerk of the city, and was first translated by Henry T. Riley 1862. Interesting particulars respecting Whittington are given by Mr. Riley in the preface to the above work, and his memory as an historical character has been vindicated by Rev. Samuel Lysons in his book, *The Model Merchant of the Middle Ages, exemplified in the Story of Whittington and his Cat* (London, 1860).

Whittlesey, CHARLES: geologist, mining engineer, and archæologist; b. at Southington, Conn., Oct. 4, 1808; removed to Ohio in 1813; graduated at West Point 1831; served one year as lieutenant and then resigned to study and practice law; editor of the *Cleveland Whig and Herald* 1836–37; assistant on first Geological Survey of Ohio 1837–39; from 1844 until the civil war gave principal attention to the geology and mineral resources of the northern portions of Michigan, Wisconsin, and Minnesota, being connected at times with the surveys in charge of Owen and Foster and Whitney, and at other times with various mining companies. During the war he served as engineer, and was promoted to a colonelcy in 1861, but resigned on account of ill health in 1862. D. at Cleveland, O., Oct. 18, 1886. He was a pioneer in American archæology, investigating Indian mounds, caves, and rock inscriptions in Ohio and about Lake Superior. The list of his minor writings is long, and they are scattered through many periodicals. Some of them were collected by himself under the title *Fugitive Essays*, and published at Hudson, O., in 1852. Among his more extended as well as more important papers are three printed as Smithsonian Contributions to Knowledge: *Fluctuations of Level in the North American Lakes* (1860); *Ancient Mining on the Shores of Lake Superior* (1863); *The Fresh-water Glacial Drift of the Northwestern States* (1866).

Whittredge, WORTHINGTON: See the Appendix.

Whitworth, Sir JOSEPH, Bart., F. R. S., LL. D., D. C. L.: mechanic and engineer; b. at Stockport, England, 1803; became a tool-maker, and from 1833 to 1854 devoted himself to the improvement and production of those machine tools which made his name known throughout the civilized world. He was the first to manufacture and introduce into general use standard gauges for mechanical work of such accuracy as to secure uniformity in the products of all shops using them. He also established the standard screw-threads now used in Great Britain, Russia, Italy, and Germany, and known throughout the world. In 1854 he also turned his attention to the manufacture of rifles, and in 1857 submitted for trial a small-arm far superior to any then existing, and embodying the principles upon which modern improvements have been based, viz., reduction of bore (·45 inch), an elongated projectile (3 to 3½ calibers), more rapid twist (one turn in 20 inches), and extreme accuracy in manufacture. This rifle, after distancing all others in competition, was rejected by the British Ordnance Board as being of too small caliber for a military weapon. In the construction of cannon, he was equally successful in his products, and unsuccessful in their adoption, making in 1862 a rifled gun of high power, whose proportions were almost the same as those used to-day; but this was rejected by the ordnance board, and the progress of improvement in ordnance retarded in Great Britain nearly twenty years by the adoption of the Woolwich patterns. To secure a gun-steel which would satisfy his requirements, he perfected the process of "fluid compression," now used for the manufacture of the highest grades of mild steel not only for guns, but also for steamer's shafts, etc. Space will not allow a reference to his many other contributions to mechanical science and art. In addition to his degrees from Oxford and Dublin, he was appointed by Napoleon III. to the Legion of Honor in 1868, and made baronet in 1869. In 1869 he gave £100,000 to found scholarships for the promotion of mechanical science, from which every year £3,000 is distributed among the younger engineers of England. His writings include *Miscellaneous Papers on Mechanical Subjects* (1858); *Papers on Practical Subjects: Guns and Steel* (1873); and *Essays on Mechanical Subjects* (1882). D. at Monte Carlo, Italy, Jan. 22, 1887. JAMES MERCUR.

Whitworth Guns: See ARTILLERY.

Whooping Cough: an infectious and epidemic disease, generally occurring but once in the life of an individual, and usually during infancy or childhood. It is characterized by paroxysms of convulsive coughing, followed by a long ringing inspiration, whence the name. The duration of the disease varies from two to several months. It is the chin-cough of early English physicians, the *perlussis* of Sydenham, and the *coqueluche* of French authorities, and was formerly confounded with the catarrhal affections, which it much resembles in its symptoms. The specific cause has not as yet been positively demonstrated, though it is claimed that a certain bacillus is the germ peculiar to the disease. The simple disease is seldom fatal, but when complicated with pulmonary disease is very dangerous.

Whortleberry, Hurtleberry, or **Huckleberry**: a well-known American edible berry, being the fruit of plants of the genera *Gaylussacia* and *Vaccinium*, constituting with *Chiogenes* a sub-order of the *Ericaceæ*, or HEATH FAMILY (*q. v.*). Some of the species are known as blueberry and checkerberry in various parts of the U. S. See also BILBERRY and HUCKLEBERRY.

Whydah: the chief port of Dahomey, Africa; on the Slave Coast, Gulf of Guinea (see map of Africa, ref. 5–C). Several European trading firms were established there, and Whydah was the chief center of foreign trade in Dahomey before the French practically acquired the country (1893). The best overland route from Abomey, the capital, to the sea reaches the coast at Whydah. Palm oil is the chief article of export. C. C. A.

Whydah-bird: See WIDOW-BIRD.

Whymper, EDWARD: traveler and wood-engraver; b. in London, England, Apr. 27, 1840; educated at Clarendon House School; became a draughtsman on wood; made a series of journeys on the Continent, in one of which, in 1861, he ascended Mont Pelvoux, reputed the highest mountain in France; discovered from its summit another peak, the Pointe des Écrins, 500 feet higher, which was subsequently ascended by him (1864); was chosen a member of the Alpine Club 1861; made for several years a series of bold ascents of Alpine summits before considered inaccessible, culminating in that of the Matterhorn July 14, 1865, when four of his companions lost their lives; traveled in Northwest Greenland, collecting fossiliferous deposits for the British Museum, and made a second visit to Greenland for a similar purpose in 1872; ascended the principal peaks of the Ecuadorian Andes in 1879–80. Author of *Swiss Pictures, drawn with Pen and Pencil* (1866); *Scrambles among the Alps 1860–69* (London, 1871); and *The Great Andes of the Equator* (3 vols., 1891–92). His brother, FREDERICK WHYMPER, b. in London, July 20, 1838, is author of *Travel and Adventure in Alaska* (1868) and *The Heroes of the Arctic and their Adventures* (1875). M. W. H.

Whyte-Melville, GEORGE JOHN: See MELVILLE, GEORGE JOHN WHYTE.

Wice'lius, or **Witzel**, GEORG: theologian; b. at Vacha, Eisenach, on the Werra, 1501; studied theology at Erfurt, and was ordained a priest, though in 1520 he had been in Wittenberg, and heard Luther and Melanchthon; was appointed curate at Vacha, where he embraced the Reformation and married. He preached against ecclesiastical abuses and the oppression of the common people. From Vacha he went as parish priest at Wenigen-Lupnitz, in Thuringia, but was compelled to leave because he was suspected, unjustly, of sympathy with the peasants in the Peasants' war. In 1525 he was appointed pastor of Niemegk, a town 27 miles S. S. W. from Potsdam, on Luther's recommendation, but relapsed into Romanism, attacked with great violence the Lutheran doctrines concerning good works and the Church, and had a falling out with the Lutheran leaders, and was expelled in 1530. He led a wandering life henceforth, never staying long in a place. For a time he was at Eisleben, then at Dresden; in 1540 was in Fulda, where he wrote his *Querela pacis*; in 1554 removed to Mayence, where he lived in retirement till his death, 1573. His principal work was his *Typus ecclesiasticus*, 5 vols. (1540–48). See G. L. Schmidt, *Georg Witzel ein Altkatholik des 16. Jahrhunderts* (Vienna, 1876). Revised by S. M. JACKSON.

Wichern, *vich'ern*, JOHANN HEINRICH: philanthropist; b. in Hamburg, Germany, Apr. 21, 1808; studied theology at Göttingen and Berlin; started, after his return home, a Sunday-school for the poorest and most abandoned children of the city, and ultimately had 500 pupils under his care; opened in 1833 at Horn, near Hamburg, the *Rauhe Haus*, a reformatory for vagrant children, the miserable, often weak-minded, but often also wicked-minded, children who were received being portioned off into families of twelve, and placed under the charge of a young workman, who taught them a trade, the beneficent effects of which institution were so great that it was soon imitated, not only in various places in Germany, but also in Great Britain, France, and Holland. In 1848 the Protestant Ecclesiastical Assembly at Wittenberg combined, for the purpose of united action, all the inner missions under one central committee, at the head of which Wichern was placed, and finally, in 1858, the Prussian Government appointed him superintendent of all penal and correctional institutions of the country.

He published *Die innere Mission* (Hamburg, 1849; 3d ed. 1889); *Die Behandlung der Verbrecher* (Hamburg, 1853); *Der Dienst der Frauen in der Kirche* (Hamburg, 1858; 3d ed. 1880). From 1844 he issued the monthly *Fliegende Blätter des Rauhen Hauses.* D. in Hamburg, Apr. 7, 1881. His *Life* was written by Oldenburg (Hamburg, 2 vols., 1881–86) and Krummacher (Gotha, 1882).

Wichita, wish'i-taw: city (founded in 1870); capital of Sedgwick co., Kan.; on both sides of the Arkansas river, and on the Atch., Top. and S. Fé, the Chi., Rock Is. and Pac., the Mo. Pac., the St. L. and San Fran., and the Wichita and West. railways; 100 miles S. W. of Emporia, 161 miles S. W. of Topeka (for location, see map of Kansas, ref. 7–G). It is the center of a great wheat-growing and stock-raising region, and an important commercial shipping-point. The city is laid out regularly, has a mild and healthful climate, and is provided with improved systems of water-works, sewerage, gas and electric street-lighting, and electric street-railways. Griswold, Linwood, and Riverside parks are conveniently situated and well adapted to public purposes. The public buildings include the U. S. Government building, county building, city-hall, city hospital, and the Carey hotel. There are 37 churches and other places of worship, viz.: Methodist Episcopal, 8; Presbyterian, 7; Baptist, 5; Congregational, 4; Christian, 2; Lutheran, 2; Roman Catholic, 2; and Protestant Episcopal, Unitarian, United Brethren, German Reformed, Friends, Adventist, and Scientist, each 1. The public schools have an enrollment of over 6,000 pupils, and cost about $71,000 per annum. Advanced instruction is afforded by Garfield University (Christian, chartered 1886), Wichita University, Fairmount Institute, All Hallows' Academy, Lewis Academy (Presbyterian), Southwestern Business College, and the Wichita Commercial College. There are 2 national banks with combined capital of $250,000, 2 State banks with combined capital of $250,000, a private bank, and 3 daily and 12 weekly newspapers. Among charitable institutions are 2 hospitals, 2 homes for children, and a home for reformed women. The business interests of the city comprise extensive stock-yards and meat-packing houses, wholesale houses in general merchandise, and manufactories of agricultural implements, chemicals, flour, sash and doors, wagons, spring beds and mattresses, brooms, hose-couplers, harness, bottled goods, trunks, soap, and ice. Pop. (1880) 4,911; (1890) 23,853; (1900) 24,671. CHARLES K. HATTON.

Wichita Falls: town; capital of Wichita co., Tex.; on the Wichita river, and the Wichita Valley Railway; 51 miles N. E. of Seymour, 113 miles N. W. of Fort Worth (for location, see map of Texas, ref. 1–G). It is in an agricultural and grazing region, and has 2 national banks with combined capital of $150,000, and 3 weekly newspapers. Pop. (1880) not in census; (1890) 1,987; (1900) 2,480.

Wick: a royal and parliamentary burgh of Scotland; capital of the county of Caithness; at the mouth of the Wick; 161 miles by rail N. N. E. of Inverness and 263 miles N. of Edinburgh (see map of Scotland, ref. 4–H). It is at the head of a small bay, which affords good harbor accommodation for vessels of light draught and the large fleets of fishing-boats engaged in the herring-fishery, of which this is a very important center. The town consists of Wick proper, on the northern bank of the river, and Pulteney, on the southern. Pop. (1891) 8,464.

Wickliffe, JOHN: See WYCLIF.

Wicklow: county of Ireland, bordering E. on the Irish Sea; area, 781 sq. miles. The surface rises in the middle in a group of mountains 3,000 feet high, sometimes well wooded and picturesque, sometimes barren and wild. On the slopes of these mountains are good pastures and tracts of fertile soil. Crops of oats, potatoes, and wheat are grown, and there is some dairy farming. Pop. (1891) 61,934. Chief town, Wicklow; pop. 3,390.

Wicksteed, PHILIP HENRY, M. A.: clergyman and author; b. at Leeds, England, Oct. 25, 1844; educated chiefly at University College, London, Manchester New College, and Leyden University; pastor successively of Mary Street chapel, Taunton, Old chapel, Dunkinfield, and Little Portland Street chapel, London; university extension lecturer in London: lecturer on sociology, Oxford; warden of University Hall, London. He is the author of *Dante, Six Sermons* (1880); *Alphabet of Economic Science* (1888); *Henrik Ibsen, Four Lectures* (1892); and has published translations from the Dutch as follows: Ort and Hooykaas's *Bible for Young People* (6 vols., 1873–79); Kuenen's *National Religions and Universal Religions* (1882) and *Pentateuch* (1886); and from the French, Reville's *Native Religions of Mexico and Peru* (1884); and d'Alviella's *Origin and Growth of the Conception of God* (1892).

Wiclif: See WYCLIF.

Wicopy: See LEATHER-WOOD.

Widdin: town; in Bulgaria; on the Danube, near the Servian frontier; surrounded by morasses and strongly fortified (see map of Turkey, ref. 2–C). Large vessels can ascend the Danube to its harbor, and an important trade is carried on in wool, skins, furs, tallow, salt fish, and wheat. The Russians were defeated here in 1828. Pop. (1893) 14,551. E. A. G.

Widgeon, or **Wigeon** [from O. Fr. *vigeon, vingeon*, widgeon < Lat. *vipio, vipio'nis*, a kind of small crane]: any duck of the genus *Mareca*. The bill is shorter than the head (about equal to the claw of the inner toe), rather high, with its sides parallel nearly to its end, the end somewhat obtusely pointed, and the nail at the tip a third as broad as the bill itself; the tail is pointed, and less than half the length of the wings. Four species are known, two of which are inhabitants of the northern hemisphere, and two of the southern. The northern species are closely related, and are, on the whole, representatives of each other in their respective countries, but both wander sometimes beyond their natural limits. The European widgeon (*M. penelope*) has the head and neck reddish brown or cinnamon, with the feathers of the former slightly spotted with dusky, and those of the latter nearly uniform; the head is further diversified by cream color on the top, and by green in a band around the eye, and in a few spots behind it. The American widgeon (*M. americana*) is distinguished by the head and neck being in the main grayish, with the feathers of the former thickly spotted, and of the latter banded with black; the head is also relieved by white on the top, and by green in a broad and continuous patch around and behind the eye. The species remain farther to the southward than many of their kindred, the American widgeon breeding in Northern Dakota and Montana. Revised by F. A. LUCAS.

Widow: See DOWER.

Widow-bird [(by analogy of *widow*) for *whidah-bird*, named from *Whidah* (or *Whydah*), in Dahomey, West Africa, where the bird abounds]: any species of *Vidua* and related genera belonging to the family *Ploceidæ*. See WEAVER-BIRDS. The species have the bill conic, but more or less arched, and advancing on the forehead in a point; the wings are moderate, "with the first quill spurious; the second nearly as long as the third; the third, fourth, and fifth nearly equally long"; the tail is variable, but in the males some of the coverts and tail-feathers are usually greatly developed; the tarsi are slender, shorter than the middle toe, and covered in front with large plates; the toes are rather slender, and the hind one especially so, being as long as the inner; the claws are all long and moderately curved, and the hindermost developed. The species are peculiar to Africa. They feed chiefly upon grains. The nest is generally complex, and elaborately woven. The excessive development of the plumage, and especially the tail-feathers, of the males is peculiar to the breeding season. Sixteen or seventeen species are known, the most familiar of which are the *Vidua principalis* and *V. paradisea*. F. A. L.

Widukind: See WITTEKIND.

Wieck, CLARA: See SCHUMANN, ROBERT.

Wiedemann, GUSTAV HEINRICH: See the Appendix.

Wiedersheim, *vee'ders-hīm*, ROBERT ERNST EDWARD: anatomist; b. at Nürtingen, in Würtemberg, Germany, Apr. 21, 1848; educated in the gymnasia of Stuttgart and Lausanne, and then studied medicine in the University of Tübingen. During the Franco-German war he served in the German army as assistant surgeon. At the close of the war he returned to his studies, first at Würzburg, then at Freiburg in Baden, and passed his final examination in Jan., 1872. He was then appointed prosector to Kölliker at Würzburg; in 1876 he went to Freiburg as Extraordinary Professor of Anatomy, and in 1881 was made ordinary professor. Most noticeable among his works are his two manuals of comparative anatomy, and his papers on the skull of the Urodele Batrachia, the anatomy of the Cæcilians, development of Proteus, and on the appendicular skeleton of the vertebrates. His work in completing Ecker's monograph on the frog should also be mentioned. J. S. KINGSLEY.

Wieland, *vee'laănt*, Christoph Martin: poet; b. at Oberholzheim, Würtemberg, Sept. 5, 1733; received a careful education from his father, in the school of Klosterbergen, near Magdeburg, and under a private tutor at Erfurt. He wrote Latin and German verses when only twelve years old. In 1750 he went to the University of Tübingen for the purpose of studying law, but soon devoted himself exclusively to philology, philosophy, and literature. Following an invitation of Bodmer, whom he had sent his unfinished epic *Hermann*, he went in 1752 to Zürich, and remained for two years in the house of Bodmer as the latter's guest and literary assistant. He then accepted a position as a private tutor at Berne, deeply engaged all the while in various kinds of literary production, though without any remarkable result. From 1760 to 1769 he lived at Biberach, a free imperial city not far from his birthplace, where he held an office in the civil service, and here, or rather at the residence of Count von Stadion in the neighboring Warthausen, he came in contact with the German nobility, whose life, half sentimental and half frivolous, greatly influenced him, and produced an entire change in his views and in his literary productions. In this period he wrote *Don Sylvio de Rosalva* (1764), *Komische Erzählungen* (1766), *Agathon* (1767), all of a very captivating but rather doubtful character; the didactic poem *Musarion* (1768), very elegant in its form, and in those days very startling in its ideas; and a prose translation of Shakspeare in 8 vols. (1762–66), which was the first introduction of the English poet to the German public. In 1767 he received a chair of philosophy in Erfurt, and held it to 1772, in which year he published, among other things, *Combabus* and *Der neue Amadis*, a comic poem in 18 songs. In 1772 he was called to Weimar as tutor to the young duke, and he remained there till his death Jan. 20, 1813, residing partly in the city itself, partly at his estate in the neighborhood, Osmannstedt, where he was buried in the garden. With Goethe, Schiller, and Herder he was on intimate terms, though the enormous literary activity which he developed followed other courses and sometimes occasioned collisions. He edited *Teutscher Mercur* (1773–95), *Attisches Museum* (1796–1804), and *Neues Attisches Museum* (1805–09): translated and annotated the epistles and satires of Horace (1788–89), all the works of Lucian, and Cicero's letters (5 vols., 1808–12); wrote *Oberon* (1780), his best and most celebrated work, a romantic epic, translated into English by W. Sotheby (London, 1826); *Neue Göttergespräche* and *Geheime Geschichte des Philosophen Peregrinus Proteus* (1791), imitations of Lucian; *Geschichte der Abderiten* (1774; translated into English by H. Christmas under the title *The Republic of Fools, being the History of the State and People of Abdera in Thrace*, 2 vols., London, 1861); *Aristipp und einige seiner Zeitgenossen* (1800–01), his last romance. The first collected edition of his works was published by himself in 42 vols. (1794–1802), the second by Gruber in 50 vols. (1818–28); subsequently several other more or less complete editions have appeared. Of his letters the most important collections are *Ausgewählte Briefe* (4 vols., 1815), *Auswahl denkwürdiger Briefe* (2 vols., 1815), and *Briefe an Sophie La-Roche* (1820). Considered by themselves, simply as productions of art, Wieland's works have, with a few exceptions, lost somewhat of their interest. The frivolity of his humor, the sensuality of his imagination, are covered, but not always redeemed, by the sprightliness of his wit and by the quickness and compass of his feeling. After Luther, he is the first great poet in the German literature to whom verse was a natural form of speech, and beneath the elegance and refinement of form, which he learned partly from the French and partly from the Greek literature, there moves in all his works a native grace, a genuine spirit of sweetness and cheerfulness. He thus made German fiction attractive to the upper classes of German society, which had hitherto neglected it, and became an important element, the model of naturalness, in the education of Goethe. Many important issues in modern literature in Germany—the worship of Shakspeare, the enthusiasm for the Middle Ages, etc.—can be traced back to him as one of their sources or found in him one of their earliest and most effective supporters. His statue by Gasser was raised in Weimar Sept. 4, 1857. See Gruber, *Wielands Leben* (1827); Löbell, *Entwickelung der deutschen Poesie* (Brunswick, 1858); Hallberg, *Wieland* (1869); E. Ranke, *Zur Beurtheilung Wielands* (1885); Muncker, *Wielands Hermann* (1882); L. Hirzel, *Wieland und Martin und Regula Künzli*; Pröhle, *Lessing, Wieland, Heinse* (1877). Revised by Julius Goebel.

Wieliczka, *vyee-litch'kaă*: mining town in Austrian Galicia, 6 miles S. E. of Cracow (see map of Austria-Hungary, ref. 3–H); celebrated for the largest and richest salt mines in the world. The time of their discovery is unknown, but that they were known as early as the year 1044 is historically proven. King Casimir the Great of Poland was the first to work the mines, and Augustus II. improved their cultivation by the introduction of skilled Saxon miners. By the first partition of Poland in 1772 they fell to Austria. The mines now extend under the town from E. to W. 4,000 meters, from N. to S. 1,200 meters, and 386 meters in depth, and are worked by more than 1,000 men. They yield annually about 65,000 tons of salt. The strange labyrinth of underground streets, squares, and chambers with pillars, columns, statues, and candelabra, all hewn out in the salt, and the two lakes navigated by small boats, are unparalled elsewhere. Pop. of town about 6,280. H. S.

Wieniawski, Henri: See the Appendix.

Wiertz, *veertz*, Antoine Joseph: painter; b. at Dinant, Belgium, Feb. 22, 1806, in humble circumstances; was admitted as a pupil in the art school of Antwerp in 1820; won the great prize in 1834; studied for some years in Rome, and settled after his return at Brussels. The first period of his artistic career (1834–48) is characterized by colossal representations of mythological or biblical subjects—*Contending for the Body of Patroclus* (1835), 20 by 30 feet; the *Revolt of the Angels*, the *Flight from Egypt*, the *Triumph of Christ* (1848), 50 by 30 feet—and by very fierce polemics against certain features of modern art-life. He refused to sell any of his pictures; offered his *Patroclus* as a prize to him who could show thoroughly the mischievous influence of journalism on art; put his own name on a picture by Rubens, sent it to the committee of a Paris exhibition, and made the unfortunate judges the laughing-stock of Europe when they rejected it. In 1847 the Belgian Government built him a large studio after his own designs, and between 1848 and 1853 he succeeded in perfecting the discovery of a new method of painting, which he called *peinture mate*, and which combines the qualities of fresco and oil painting. In the later period of his life (1853–65) his polemical temper developed into a grotesque humor, and his pictures became less pretentious in size and richer in conception: *The Last Cannon, A Second after Death, Napoleon in Hell, Precipitate Inhumation, Visions of a Head cut off*, etc. Devoting himself almost wholly to these quaint and gloomy subjects, he allowed the artistic qualities of his pictures to be inferior to what his great abilities might have made them, though he kept to the end some of the vigor and the freshness of his prototype, Rubens. He bequeathed all his pictures to the state, and they are now exhibited in the so-called Wiertz Museum, his former studio. He also wrote *Éloge de Rubens* (1840) and *L'École flamande de Peinture* (1863), both of which were crowned by the Belgian Academy. D. at Brussels, June 18, 1865. See Labarre, *Antoine Wiertz* (Brussels, 1866). Revised by Russell Sturgis.

Wiesbaden, *vees'baa-den*: town; province of Hesse-Nassau, Prussia; beautifully situated at the foot of Mt. Taunus, on the Salzbach, an affluent of the Rhine (see map of German Empire, ref. 5–D). It is neatly built, and one of the most popular watering-places of Germany. It contains fourteen hot saline springs, of which the principal has a temperature of 156°, and is very copious. These springs, which are considered efficacious in cases of gout and rheumatism, were known to the Romans (*Aquæ Mattiaceæ*), and they are now generally used by about 80,000 persons each season. Pop. (1895) 74,122. Revised by M. W. Harrington.

Wife: See Married Women.

Wiffen, Benjamin Barron: editor; b. near Woburn, Bedfordshire, England, in 1794, of a Quaker family; devoted himself to the study of Spanish literature, and especially of the Spanish Reformers of the sixteenth century, whose numerous writings he rescued from long neglect by the publication, with the assistance of Don Luis de Uroz y Rios, of *Reformistas Antiguos Españoles, or the Works of Spanish Reformers reprinted and edited* (29 vols., 1848–69), with biographical and bibliographical notices. His collections are now in the library of Wadham College, Oxford. D. Mar. 18, 1867. See Robertson's *The Wiffen Brothers*.

Wiffen, Jeremiah Holmes: poet and translator; brother of Benjamin Barron Wiffen; b. at Woburn, England, in 1792; was for a number of years a schoolmaster, and subsequently librarian to the Duke of Bedford at Woburn Abbey,

retaining that position until his death May 2, 1836. He published poetical translations of Garcilaso de la Vega (1823), and of Tasso's *Jerusalem Delivered* (2 vols., 1824–25), and *Historical Memoirs of the House of Russell from the Norman Conquest* (2 vols., 1833), besides several volumes of original verse. He contributed poems to the annuals, and made some translations from the Welsh *Triads*.

Wigan: town; in Lancashire, England; on the Douglas; 18 miles W. N. W. of Manchester (see map of England, ref. 7–F). It is in the center of a rich coal-field, and has iron and brass foundries, paper-mills, cotton-spinning factories, and manufactures of cotton goods, nails, edge tools, and chemicals. Wigan returns one member to Parliament. Pop. (1891) 55,013; (1901) 60,770.

Wigeon: See WIDGEON.

Wigglesworth, MICHAEL: clergyman; b. probably in Yorkshire, England, Oct. 18, 1631; was taken to Charlestown, Mass., by his father 1638, and thence in the same year to New Haven, Conn.; graduated at Harvard 1651; became tutor and fellow there; studied divinity; was ordained minister of the church at Malden 1656; had some skill as a physician, and was offered the presidency of Harvard 1684, but declined on account of ill health, being "a little feeble shadow of a man." He preached the election sermon 1686, and the artillery election sermon 1696. D. at Malden, June 10, 1705. Author of *The Day of Doom, or a Poetical Description of the Great and Last Judgment, with a Short Discourse on Eternity* (1662), which went through two editions in England, and was long one of the most popular books in New England (6th ed. 1715). In it occurs the famous passage assigning to non-elect deceased infants "the easiest room in hell" (verse clxxxi.). Another small volume, "intended for poetry" (*Allibone*), was entitled *Meat out of the Eater, or Meditations concerning the Necessity, End, and Usefulness of Afflictions unto God's Children, all tending to Prepare them for and Comfort them under the Cross* (1669; 6th ed. 1770). He left in MS. a poem entitled *God's Controversy with New England*, printed in the *Proceedings* of the Massachusetts Historical Society, 1871. An edition of his *Day of Doom*, with the addition of other poems and a *Memoir, Autobiography, and Sketch of his Funeral Sermon by Rev. Cotton Mather*, has been issued by William H. Burr (New York, 1867), and John Ward Dean published a *Sketch of his Life, with a Fragment of his Autobiography, some of his Letters, and a Catalogue of his Library* (Albany, 1863; new ed. 1871).
Revised by S. M. JACKSON.

Wight, wīt, ORLANDO WILLIAMS: author; b. at Centreville, N. Y., Feb. 19, 1824; educated at Westfield Academy and at Rochester Collegiate Institute; ordained to the Universalist ministry; settled as a literary man at Brooklyn, N. Y.; subsequently studied medicine, and practiced in Wisconsin; appointed State geologist and surgeon-general 1874; health commissioner of Milwaukee 1878–80; health officer of Detroit. He was the author of *Lives and Letters of Abelard and Heloise* (1853; new ed. 1861); edited *The Philosophy of Sir William Hamilton* (1853); twelve volumes of *Standard French Classics* (1859, *seq.*); and *The Household Library* (18 vols., 1859, *seq.*); translated, with Frederick W. Ricord, Victor Cousin's *Course of the History of Modern Philosophy* (2 vols., 1852); and *Lectures on the True, the Beautiful, and the Good* (1854); *Maxims of Public Health* (1884); and *People and Countries*, travels (1888); and aided Miss Mary L. Booth in her translation of Henri Martin's *History of France* (4 vols., 1863). D. at Detroit, Mich., Oct. 19, 1888. Revised by H. A. BEERS.

Wight, Isle of: an island in the English Channel, belonging to the county of Hampshire, England, from which it is separated by the roadstead of Spithead. Area, 145 sq. miles. It is traversed from E. to W. by a range of chalk downs rising between 600 and 700 feet, which presents a great variety of fine scenery. The soil is very fertile, and the climate remarkably mild and equable. Wheat, vegetables, and fruits are extensively cultivated, and a fine breed of sheep is reared on the downs. The island is much resorted to as a bathing-place and by consumptives. The island was known as *insula Vectis* by the Romans, who conquered it in the reign of Vespasian, and there are many evidences of the Roman occupation. Near the town of Cowes is Osborne House, where Charles I. was imprisoned for a short time, which was a favorite residence of Queen Victoria. Pop. (1891) 78,718.

Wigram, Sir JAMES: jurist; b. at Walthamstow, England, in 1793, of Irish descent; educated at Trinity College, Cambridge; graduated in 1815, and became a fellow of Trinity in 1817; was called to the bar at Lincoln's Inn 1819; took up chancery practice, and was made king's counsel in 1834; entered Parliament for Leominster 1841; vacated his seat, and was knighted and made second vice-chancellor Oct., 1841; held this office until 1850, when, after becoming totally blind, he retired, and was granted a pension of £3,500. D. July 29, 1866. He is the author of *An Examination of the Rules of Law respecting the Admission of Extrinsic Evidence in Aid of the Interpretation of Wills* (2d ed. 1835), of which the second American edition was annotated by Theodore W. Dwight, LL. D., and of *Points in the Law of Discovery* (2d ed. 1840). F. STURGES ALLEN.

Wigton, or Wigtown: county of Scotland, occupying the southwestern corner of the country, and bordering S. on the Irish Sea and W. on the North Channel: comprises the western district of the ancient province of Galloway, Loch Ryan, and Luce Bay, which almost intersect the county from the peninsula, 28 miles long, which is known as the Rhinns of Galloway. The surface is undulating, and gradually rises toward the N. to a height of 1,500 feet. It consists to a great extent of moorland, interspersed with small lakes, but it contains some fine pastures where an excellent breed of cattle is reared, and some tracts of good soil highly cultivated. Pop. (1901) 32,591. The chief towns are Stranraer, Wigtown, Newton-Stewart, Whithorn, Glenluce, and Portpatrick. Wigtown, the county-town, is a royal burgh with a population of 1,509. It is 126 miles S. W. of Edinburgh. Here on May 11, 1685, an old woman and a girl were tied to stakes and drowned by the incoming tide because of their refusal to take the Abjuration Oath.

Wijnants: See WYNANTS.

Wilamowitz-Möllendorf, ULRICH, von: classical scholar; b. in Markowitz, Posen, Germany, Dec. 22, 1848; studied in Bonn and Berlin; privat docent in Berlin 1874; professor ordinarius in Greifswald 1876; since 1883 in Göttingen. His chief works are: *Analecta Euripidea* (1875); *Callimachus* (1882); Æschylus's *Agamemnon* (1885) and Euripides's *Hippolytus* (1891), translated into German verse; Aristotle's *Athenian Constitution* (with Kaibel, 1891); Euripides's *Heracles* (2 vols., 1889; 2d ed. 1895), with introduction and commentary; *Aus Kydathen* in *Philologische Untersuchungen* (vol. i., 1880); *Antigonos v. Karystos* in vol. iv. (1881); *Homerische Untersuchungen* in vol. vii. (1884); *Isyllos von Epidauros* in vol. ix. (1886); *Aristoteles und Athen* (2 vols., 1894); *Die Thucydideslegende* (1877); *Die Bühne des Aeschylus* (1886); *Die sieben Thore Thebens* (1891), etc. Editor of M. Haupt's *Opuscula* (3 vols., Leipzig, 1876). ALFRED GUDEMAN.

Wilber: village (founded in 1873); capital of Saline co., Neb.; on the Big Blue river, and the Burl. and Mo. River Railroad; 31 miles S. W. of Lincoln (for location, see map of Nebraska, ref. 11–G). It is in an agricultural region; has 6 churches, court-house, high school, 2 State banks with combined capital of $75,000, and 3 weekly newspapers; and has 2 large flour-mills, steam grain elevators, and cigar-factories. Pop. (1880) 710; (1890) 1,226; (1900) 1,054. PUBLISHER OF "REPUBLICAN."

Wilberforce, ROBERT ISAAC: clergyman and author; son of William; b. at Bloomfield House, near Clapham Common, England, Dec. 19, 1802; graduated at Oxford 1823; became fellow, tutor, and examiner at Oriel College; took orders in the Church of England; was for some years vicar of East Farleigh, Kent, and of Burton Agnes 1840; became archdeacon of the East Riding of Yorkshire Jan. 14, 1841, and prebendary of York Feb. 8 of the same year; resigned these preferments 1854 on being received into the Roman Catholic Church at Paris, and entered an ecclesiastical academy at Rome with a view to the priesthood. He was a joint author of his father's *Life*, and author of *The Five Empires, an Outline of Ancient History* (1840); *Rutilius and Lucius, or Stories of the Third Age* (1842); *Church Courts and Church Discipline* (1843); *The Doctrine of the Incarnation* (1848); *The Doctrine of Holy Baptism* (1849); *A Sketch of the History of Erastianism* (1851); *The Doctrine of the Holy Eucharist* (1853); 2 vols. of *Sermons* (1850–54); and *An Inquiry into the Principles of Church Authority, or Reasons for Recalling my Subscription to the Royal Supremacy* (1854). D. at Albano, near Rome, Feb. 3, 1857.
Revised by J. J. KEANE.

Wilberforce, SAMUEL, D. D.: bishop; third son of William; b. at Clapham, England, Sept. 7, 1805; educated at Oriel College, Oxford, and graduated 1826; took orders in the Church of England; became curate of Checkendon, Oxfordshire, 1828; rector of Brixton (Brightstone), Isle of Wight, 1830; select preacher before the University of Oxford 1837 and again 1845; archdeacon of Surrey 1839; rector of Alverstoke, Hampshire, 1840; canon of Winchester Cathedral 1840; chaplain to Prince Albert 1841; sub-almoner to the Queen 1844; dean of Westminster Mar., 1845; Bishop of Oxford and *ex-officio* chancellor of the order of the Garter Nov., 1845; lord high almoner to the Queen Nov., 1847; and Bishop of Winchester Oct., 1869. He was a leader of the High Church party, but an opponent of ritualism; was distinguished for eloquence and wit, for his efficiency as a bishop, and for his skill as a debater in convocation and in the House of Lords. The versatility of his opinions earned him the sobriquet of "Soapy Sam," by which he was popularly known, because, as he wittily explained, "he was always in hot water, and always came out of it with clean hands." He was killed by a fall from his horse, near Dorking, July 19, 1873. He was author of *Note-Book of a Country Clergyman* (1833); *Eucharistica* (1839); *Sermons preached before the University of Oxford* (2 series, 1839–62); of several other volumes of sermons; *The Rocky Island, and other Parables* (1840; 14th ed. 1870; new ed. 1892); *A History of the Protestant Episcopal Church in America* (1844); *Heroes of Hebrew History* (1870; new ed. 1892); *Speeches on Missions* (1874); and many miscellaneous publications. See his *Life*, by Canon A. R. Ashwell and his son Reginald Gaston Wilberforce (3 vols., 1881–82; condensed by the son, 1888); cf. G. W. Daniell, *Bishop Wilberforce* (1891). Revised by S. M. JACKSON.

Wilberforce, WILLIAM: philanthrophist; b. at Hull, England, Aug. 24, 1759. As early as 1773 he published in a newspaper a letter "in condemnation of the odious traffic in human flesh." At the age of nine he was sent to the grammar school of Hull, and in 1776 he entered St. John's College, Cambridge, and being the master of an independent fortune, of a genial temper, self-indulgent, playful, and witty, and thrown without restraint into the society of "as licentious a set of men as could well be conceived" (to use his own words), the risk to his health, his morals, and his general welfare was extreme. Notwithstanding his temptations to idleness, he became a good classic and creditably passed the college examinations. At Cambridge he formed an acquaintance with William Pitt, which afterward ripened into intimacy. Having determined to enter public life, he offered himself for Hull (in 1780), and after a sharp contest was elected to Parliament. In 1784 he was elected to represent the county of York, a success which seemed to open before him the most gratifying prospects. The years 1785–86 witnessed a change in his religious convictions which modified the whole course of his future life. The result of this was that he began in 1787 a series of efforts for the reformation of manners, and especially for abolishing the African slave-trade. The latter subject was brought into Parliament, and after overcoming many obstacles he opened the debate against the traffic on May 12, 1789, in a speech of great beauty and power. In this philanthropic effort he was supported by Burke, Pitt, and Fox. Although defeated, he renewed the effort whenever there seemed a chance of success, and finally, in 1807, after a struggle of nearly twenty years, had the joy of seeing the bill making it illegal for a British citizen to carry on the slave traffic passed by both houses. It received the royal assent on Mar. 25, and became the law of the land. In 1797 Wilberforce published his book entitled *A Practical View of the Prevailing Religious System of Professed Christians in the Higher and Middle Classes of this country, contrasted with Real Christianity.* In 1825 Wilberforce retired from Parliament after a continuous service of nearly forty-six years, during which his labors had been conspicuous and unceasing for every measure, public or private, tending to ameliorate suffering, to relieve the oppressed, and to elevate the moral and religious condition of the kingdom. Among the most important of these were his efforts in behalf of the Bible and missionary societies, for Roman Catholic emancipation, against the war with America, for christianizing India, and for abolishing the slave-trade and slavery.

After leaving Parliament, he retired almost altogether from public life, and went to live upon a small estate at Highwood near London. This, however, on account of a loss of property, he was obliged to relinquish in 1831, after which he lived with his sons in Kent and the Isle of Wight. Three days before his death he had the intense pleasure of learning that the House of Commons had passed to its second reading the bill for the abolition of slavery, and he thanked God he had lived to see England spend £20,000,000 sterling in such a cause. He died in Cadogan Place, London, July 29, 1833, and, in accordance with the wishes of the nation, was buried in Westminster Abbey, "side by side with Canning, at the feet of Pitt, and within two steps of Fox and Grattan." The *Life of William Wilberforce*, 5 vols. 8vo, was written by his sons Robert Isaac and Samuel (1838; new ed., abridged, 1843); his *Correspondence* (edited by the same, in 2 vols.) appeared in 1840.
Revised by SAMUEL MACAULEY JACKSON.

Wil'braham: town (incorporated in 1763); Hampden co., Mass.; on the Chicopee river, and the Boston and Albany Railroad; 9 miles E. of Springfield (for location, see map of Massachusetts, ref. 3–E). It contains the villages of Wilbraham and North Wilbraham; has 3 churches, 9 district schools, and a public library; is noted as the seat of Wesleyan Academy (M. E., chartered in 1824); and is principally engaged in agriculture and the manufacture of paper. The town had an assessed valuation in 1894 of $744,601. Pop. (1880) 1,628; (1890) 1,814; (1900) 1,595.

Wilbrandt, *vĕel'brăant*, ADOLPH: poet; b. at Rostock, Germany, Aug. 24, 1837; studied in his native city, in Berlin, and in Munich, where for some time he edited a daily paper; visited Italy and France, and settled in 1871 in Vienna, where in 1881 he was made director of the Hofburg theater. In 1889 he resigned this position, and has since been living at Rostock, devoting himself entirely to literary pursuits. He has written a number of dramas which have been acted with success on all the principal stages of Germany; the tragedies *Graf Hammerstein* (1870); *Gracchus* (1872); *Arria und Messalina* (1874); *Giordano Bruno* (1874); *Nero* (1876); *Kriemhild* (1877); and the comedies *Jugendliebe* (1872); *Natalie* (1878). In the novels, *Adams Söhne* (1890), *Hermann Ifinger* (1892), and *Der Dornenweg* (1894), he has treated skillfully the great social and literary questions of the day. Revised by J. GOEBEL.

Wilbur, JOHN: preacher of the Society of Friends; b. at Hopkinton, R. I., July 17, 1774; opposed the introduction of religious views at variance with the original doctrines of that society; was accused in 1838 by several members of Rhode Island yearly meeting of circulating in his conversation and writings opinions and statements derogatory to the character of the celebrated Joseph John Gurney, then (1837–40) visiting the U. S.; was sustained by a large majority in his own monthly meeting (that of South Kingston), but that body having been dissolved and its members added to the Greenwich meeting, he was formally disowned by the latter body Jan., 1843, and its action was confirmed by the quarterly meeting and the Rhode Island yearly meeting. His supporters were, however, sufficiently numerous in Rhode Island and other parts of New England to form an independent yearly meeting, the members of which were known as Wilburites. They are very conservative and not aggressive. The census of 1890 gives them 4,329 members. D. at Hopkinton, May 1, 1856. He published some polemical pamphlets, and his *Journal and Correspondence* (Providence, 1859) have appeared since his death. See the *History of the Society of Friends in America*, by A. C. and R. H. Thomas (New York, 1894), pp. 266, *seq.*
Revised by S. M. JACKSON.

Wilcox, CADMUS MARCELLUS: soldier; b. in Wayne co., N. C., May 29, 1826; graduated at the U. S. Military Academy, and was commissioned brevet second lieutenant of infantry July, 1846; served in the war with Mexico. In July, 1861, he was commissioned colonel of the Ninth Alabama Regiment, and in October appointed a brigadier-general in the Confederate army. In Virginia he commanded a brigade in Longstreet's corps, was at the second battle of Bull Run, Fredericksburg, Chancellorsville, Salem Heights, Gettysburg, etc.; promoted to be major-general Aug., 1863, and commanded a division in the Mine Run campaign and throughout the campaign of 1864–65, ending with the surrender at Appomattox Court-house; chief of division of railroads, general land office, Washington, 1888–89. D. in Washington, D. C., Dec. 2, 1890. Author of *Rifles and Rifle Practice* (New York, 1859); a translation of *Austrian Infantry Evolutions of the Line* (1860); and *History of the Mexican War.* Revised by JAMES MERCUR.

Wilcox, Ella (*Wheeler*): poet; b. at Johnstown, Wis., about 1845; educated at the University of Wisconsin. In 1884 she was married to Robert M. Wilcox, of Meriden, Conn., to which place she removed, and subsequently to New York city. Her published volumes of verse include *Maurine* (Milwaukee, 1882); *Poems of Passion* (Chicago, 1883); and *Poems of Pleasure* (1888). A novel, *Mal Moulée*, appeared in 1885. H. A. B.

Wild, Heinrich: meteorologist and physicist; b. in Uster, canton of Zurich, Switzerland, Dec. 17, 1833. He was educated in Zurich at the gymnasium and the university until 1854, after which he studied physics in Königsberg. In 1857 he took the degree of Ph. D. in Zurich, and then worked for some time with Kirchhoff and Bunsen in Heidelberg. At Easter, 1858, he accepted the position of privat-docent in physics at the University in Zurich and at the Federal Polytechnic, and was in the same year called to Berne as Professor of Physics and director of the astronomical observatory or "Sternwarte," which he expanded into a meteorological Centralanstalt for the canton of Berne, and a meteorological observatory with self-registering apparatus. An inspection of the Swiss system of weights and measures, confided to him by the Bundesrath, led to the establishment of a "Federal Normal-Eichstätte," a reform which he carried out and completed by 1867. In May, 1868, he was called to St. Petersburg as a member of the Imperial Academy of Sciences and director of the Central Physical Observatory, where at his initiative and under his direction there resulted a complete reorganization and extension of this latter institution and of the system of meteorological observations in Russia connected with it, and the establishment in 1876 of a special meteorological and magnetic observatory in Pavlosk. Wild's scientific achievements have been more particularly in the domain of optics, metrology, electricity, meteorology, and terrestrial magnetism. The "polaristrobometer" (optical saccharimeter) invented by him is universally known; he also invented a polarization photometer (generally known as photometer and uranophotometer). Metrology is indebted to him for a new optical method for the intercomparison of line-to-line with end-to-end measures of length and for other improvements in methods of weights and measures that were proposed and carried out by him since 1870. In the field of electricity we owe to Wild not only the discovery of the thermo-electric streams in fluids and investigations into the laws of tension in electrolytes, but also, in more recent times, his precise determination of the absolute unit of resistance (the ohm). Of the numerous works by Wild in the field of meteorology and terrestrial magnetism, a small proportion are contained in the publications of the *Naturforschende Gesellschaft*, of Switzerland, but the greater part are to be found in the *Annalen des physikalischen Central-Observatoriums für Russland*, edited by him since 1865, and in the new *Repertorium für Meteorologie*, also published under his direction by the Academy of Sciences of St. Petersburg. M. W. H.

Wild Animals (in law): See Feræ Naturæ.

Wildbad, *v*ilt'baăt: a small town of Würtemberg, in the Black Forest; noted for its thermal springs and baths, the alkaline water of which ranges from 90° to 100° F. in temperature, considered useful in gout and rheumatism. Pop. (1890) 3,446.

Wildcat: a popular name for any one of several species of the genera *Felis* or *Lynx*. See Cat and Lynx.

Wild Cherry: the *Prunus serotina* (Ehrhart); a very common tree throughout North America, growing in all parts of the U. S. In the Western States it attains a height of from 80 to 100 feet, but in the Atlantic States it is usually much smaller. The fruit is small, about the size of a large pea, and when ripe is of a shining blackish-purple color. The wood of the wild cherry is much prized by cabinet-makers for its fine grain, handsome tint, and susceptibility to high polish. The inner bark, taken from all parts of the tree, furnishes the drug known as wild cherry. By a mistake the Latin official designation of this drug is *Prunus virginiana*, which is properly the botanical name of the choke-cherry, a different tree. Wild cherry bark is in pieces of various sizes, without epidermis, and of a light-cinnamon color. It has the odor of peach-leaves and an agreeable aromatic taste, with a flavor of bitter almonds. The important ingredients of the bark are tannin, and the peculiar principles *amygdalin* and *emulsin*, which by mutual reaction in the presence of water develop a volatile oil containing a small percentage of hydrocyanic acid. Preparations of wild cherry bark are principally employed for the purposes of a mild and agreeable stomachic tonic, a gentle calmative in bronchial affections with an irritative cough, and to impart a pleasant flavor to compound medicinal preparations. Revised by H. A. Hare.

Wilde, Oscar Fingal O'Flahertie: author; b. in Dublin, Ireland, 1856; son of Sir William Robert Wills Wilde, a surgeon, and of Jane Francesca, Lady Wilde, a woman of letters; studied at Portora Royal School, Enniskillen, then entered Trinity College, Dublin, where he obtained the Berkeley gold medal for Greek; took the Newdigate prize for English verse at Oxford 1874; studied at Magdalen College; graduated 1877; went to London 1879; became the apostle of the æsthetic movement, and was satirized under the name of "Postlethwaite" in *Punch*; lectured on art subjects in the U. S. 1882, and subsequently in England and Paris; was condemned in 1895 to penal servitude for two years for infamous conduct. Among his works are *Poems* (1880); *The Picture of Dorian Gray*, a novel; *The Happy Prince and other Tales* (1888); *Intentions*, essays (1891); *Lord Arthur Savile's Crime and other Stories* (1891); the tragedies *Guido Ferranti* (1890) and *The Duchess of Padua*; and a number of comedies, including *Lady Windermere's Fan*, *A Woman of No Importance*, and *The Importance of being Earnest*. These were played in England and the U. S., and were cleverly epigrammatic in dialogue, but wanting in dramatic interest, and distinguished by a cheap cynicism and an affectation of smartness. D. in Paris, Nov. 30, 1900. Revised by H. A. Beers.

Wilde, Richard Henry: author; b. in Dublin, Ireland, Sept. 24, 1789. His parents removed to the U. S. in 1797, and settled in Baltimore, and when he was thirteen his mother moved to Augusta, Ga. Under many difficulties he studied law; was admitted to the bar, and soon rose to high distinction in his profession. He was at different times attorney-general of Georgia and U. S. representative from the same State. He wrote a number of poems, including the famous lyric *My Life is Like the Summer Rose*, and published in 1842 *Conjectures and Researches Concerning the Love, Madness, and Imprisonment of Torquato Tasso*. While studying in Italy he discovered Giotto's portrait of Dante. A posthumous poem, *Hesperia*, was published at Boston in 1867. On retiring from Congress in 1835 he visited Europe, and spent several years in literary pursuits. After his return from Europe in 1843 he moved to New Orleans, where he renewed the practice of law with unusual success, and was elected Professor of Constitutional Law in the University of Louisiana. D. of yellow fever in New Orleans, Sept. 10, 1847. Revised by H. A. Beers.

Wilde, Thomas: See Truro, Baron.

Wildebeest: See Gnu.

Wildenbruch, *v*ild'en-broōch, Ernst, von: dramatist; b. at Beyrout, Syria, Feb. 3, 1845; son of the Prussian consul-general; went to Germany 1857; entered the Prussian army and fought as an officer in the campaigns of 1866 and 1870; studied law at the University of Berlin; entered the civil service. He is one of the most talented of the younger German dramatists, and his plays—*Die Karolinger* (4th ed. 1887); *Harold* (4th ed. 1884; translated into English by V. Heller, Philadelphia, 1891); *Der Menonit* (3d ed. 1886); *Väter und Söhne* (1882); *Christoph Marlow* (1884); *Die Quitzows* (1888); *Der neue Herr* (1891)—have been performed with great success in most German cities. He has also published a number of short stories and novels, of which *Der Meister von Tanagra* (1880) is the best. His *Lieder und Gesänge* (1877) and *Dichtungen und Balladen* (1884) contain many powerful ballads and hymns, the most popular of which is *Das Hexenlied*. Julius Goebel.

Wilder, Alexander, M. D.: physician and author; b. at Verona, Oneida co., N. Y., May 13, 1823; graduated at the College of Medicine of Syracuse University 1850; was a teacher and editor; practiced as an eclectic physician, and became in 1867 president of the Eclectic Medical College of the city of New York; lecturer on physiology and physiological medicine 1873–77; held successively the chairs of Physiology and Psychological Science in the U. S. Medical College; author of numerous monographs, including *The Intermarriage of Kindred* (New York, 1870); *The Worship of the Serpent* (1877); and *The Ganglionic Nervous System* (1887); edited Westropp's *Ancient Symbol-Worship* (New

York, 1873); Taylor's *Eleusinian and Bacchic Mysteries* (1875); and R. Payne Knight's *Symbolical Language of Ancient Art and Mythology* (1876); and has prepared a translation of Iamblichus *On the Mysteries.*

Revised by S. T. Armstrong.

Wilder, Burt Green, B. S., M. D.: comparative anatomist; b. in Boston, Mass., Aug. 11, 1841; graduated at the Lawrence Scientific School, Harvard University, 1862; in 1863 became a licentiate of the Massachusetts Medical Society, and was appointed assistant surgeon of the Fifty-fifth Massachusetts Infantry (Negro); later served as surgeon until the regiment was discharged in 1865; after a course of medical study at Dartmouth College entered the medical department of Harvard, graduating in 1866. In the same year he became assistant in comparative anatomy in the Museum of Comparative zoölogy at Harvard. He also served a year as curator of herpetology in the Boston Society of Natural History and in the winter of 1867–68 gave a course of university lectures on the morphological value and relations of the human hand. In 1867 he was elected Professor of zoölogy in Cornell University; was also Professor in the Medical School of Maine (Bowdoin College) 1874–84, and in 1876–77 lectured on zoölogy in the medical department of the University of Michigan. In 1885 he was chosen president of the American Neurological Association. Since 1880 he has given much time to the simplification of anatomical nomenclature, mainly along lines indicated by Barclay and Owen. With Prof. Simon H. Gage he is author of *Anatomical Technology as Applied to the Domestic Cat* (1882–86, 1892). His own contributions to periodical literature are numerous. The close of his twenty-fifth year of service in Cornell University was signalized by the publication of *The Wilder Quarter-Century Book*, a collection of papers by some of his former pupils.

Wilderness, Battles of the: contests between the U. S. and Confederate armies in Northern Virginia, May 6–7, 1864. The general character of the region in which they took place is that of a wilderness, by which name it is locally known. In this locality thickets of pine, scrub oak, and other trees occupied a soil composed of sand and clay, unfavorable to agriculture and very swampy when wet. Two good roads pass through this region from Orange Court-house to Fredericksburg, uniting at the place called Chancellorsville. During the winter of 1863–64 the U. S. forces, under command of Gen. Meade, were encamped near the Orange and Alexandria Railroad, between the Rappahannock and the Rapidan, the Fifth Corps guarding the railroad back to Bristoe's Station. The opposing army, under Gen. Lee, occupied a strong line, partly intrenched, on the south bank of the Rapidan, extending from Mine Run westward to Orange Court-house and Gordonsville, covering Richmond, and threatening Washington if the Union army uncovered it by a flank movement. In Mar., 1864, Gen. Grant, then commander of all the Union armies, took up his headquarters with Gen. Meade's army. Gen. Meade broke camp at midnight May 3–4, and began moving toward the Rapidan, the right, consisting of the Fifth Corps (Warren's) and the Sixth Corps (Sedgwick's), to cross at Germanna Ford; the left, comprising the cavalry (Sheridan's) and the Second Corps (Hancock's), to cross at Ely's Ford, 6 miles below. Before sunset Meade's army was established with but slight opposition in the Wilderness, with the Fifth Corps and a division of cavalry on the right, next the enemy. Gen. Grant, at 6 P. M. on the 4th, ordered an advance toward Lee next morning. Lee, however, had determined to give battle in the Wilderness, which, familiar to his soldiers, was but partially known to their opponents, and had also set his army in motion to meet his adversary. Accordingly, on the morning of May 5, the Fifth Corps and the advance of Lee's army met, a fierce encounter between some 25,000 men opening this bloody campaign. At intervals during the day others of the opposing columns met, and engaged with much valor and loss of life on both sides. The evening of May 5 found both armies face to face, and an inevitable and momentous conflict impending on the morrow. The Ninth Corps (Burnside's) and that of Longstreet on the Confederate side had not yet reached the field, toward which they marched that night. At dawn on May 6 the battle was renewed along all the opposing lines, and continued with unceasing movements and attacks, with much loss of life, until dark. The day closed with the two armies holding substantially the positions of the night before. On the morning of May 7 both armies were behind intrenched lines, each too much exhausted to renew the fight. Gen. Grant then determined to move to his left, thus covering a new line of communication with Washington either by Fredericksburg and the railroad or by Port Royal, the Rappahannock, and the Potomac, and threatening Lee's communications with Richmond. This was begun after dark on the 7th, the Fifth Corps having the advance toward Spottsylvania Court-house. Gen. Lee, however, anticipated this, and having a shorter road, his main force reached there first, and the battles of Spottsylvania followed, which for convenience are herewith described, although the "Wilderness" battles proper are considered to have ended with the movement of May 7.

Spottsylvania, Battles of, May 8–21.—The advance cavalry of the Union army occupied this place early in the morning of May 8, but were compelled to withdraw before their enemy's advancing infantry. The Fifth Corps forced the enemy back until it found itself confronting the corps of Longstreet, and severe fighting followed. During the day the Sixth Corps joined the Fifth, and a combined attack was made by them at dark, but without result. The other corps of both armies continued to arrive and take up positions, attended with constant fighting and severe loss of life. May 9, 10, and 11 were passed in movements and bloody conflicts, without being decisive. These actions include the fights at Laurel Hill—a name borne upon the records of many regiments—and near this Gen. Sedgwick was killed, and the command of the Sixth Corps was assigned to Gen. Wright. Early on the morning of the 12th a general assault was made by Gen. Grant upon Lee's position. The Second Corps (Hancock's) carried a salient, capturing a division and twenty cannon, but the subsequent resistance was so obstinate that no decisive result was obtained. The 13th to the 18th was spent in demonstrations, conflicts, and reorganization while awaiting re-enforcements. Unable to force the position at Spottsylvania, Gen. Grant issued orders for a movement toward North Anna river, around the right of Gen. Lee. The latter delayed this movement until the 21st by moving out a heavy force on the afternoon of the 19th, which attacked Gen. Grant's right, but after a sharp conflict it was driven back. Lee began to move as soon as his adversary did, and established his forces on the south bank of the North Anna, where the battles were again renewed.

North Anna, Battles of, May 23–26.—The Fifth Corps reached the North Anna on the afternoon of the 23d, closely followed by the Sixth Corps, the Second and Ninth coming up about the same time. Gen. Warren effected a crossing the same afternoon without much opposition. Soon after getting into position he was violently attacked, but repulsed the enemy with great loss. Hancock on the left effected a crossing after some fighting. On the 24th the Sixth Corps crossed, taking position on Warren's right. The attempt of Burnside, on the center, was repulsed. Finding the enemy's position on the North Anna stronger than either of his previous ones, Gen. Grant withdrew on the night of the 26th to the north bank, and moved to turn the right of the enemy's position. The battle of Cold Harbor (*q. v.*) was the next serious engagement between the two armies, and following this the movement to the James river was made. The Union losses between May 5 and June 15 were, killed, 7,620; wounded, 38,342; missing, 8,967—total, 54,929. The Confederate loss is not officially reported, but, though large, was much less than that sustained by Gen. Grant, probably not reaching beyond one-half of it. See Humphrey's *The Virginia Campaign of 1864–65*; Scribner's War Series; *The Battles and Leaders of the Civil War*; and *The Official Record.*

Revised by James Mercur.

Wild Goose: See Canada Goose.

Wild Ipecac: See Feverwort.

Wild Pumpkin: See Gourd Family.

Wild Service: See Sorb-tree.

Wiley, Harvey Washington, Ph. D., LL. D.: chemist; b. near Kent, Jefferson co., Ind., Oct. 18, 1844; educated at Hanover College (A. B. 1867), Indiana Medical College (M. D. 1871), Harvard University (B. S. 1873), and University of Berlin (1878); Professor of Latin and Greek (1868–71), and of Chemistry (1873–74) at Butler University, Indianapolis, Ind.; Professor of Chemistry, Indiana Medical College, 1873–77, and in Purdue University 1874–83. During 1881–83 he was also State chemist of Indiana, and in 1883 became chief of the division of chemistry of the U. S. Department of Agriculture. He is connected with various

scientific societies, among them the American Chemical Society, of which he was president in 1893 and 1894. He has published a large number of scientific papers, government reports, and bulletins, etc., besides *Principles and Practice of Agricultural Analysis* (3 vols.).

Wilfrid, or **Wilfred**: saint; b. in the Saxon kingdom of Northumbria about 634, of a noble family; studied at the monastery of Lindisfarne, where he became a monk; traveled in France and Italy, residing some time at Rome; built a monastery at Ripon 663; was commissioned by King Alcfrid to regulate the usages of the Northumbrian Church upon the time of celebrating Easter, on which subject a famous council was held at Whitby (664) in the royal presence; was appointed by the king Bishop of York, and consecrated as such at Paris, but was opposed by Ceadda (St. Chad), who had taken possession of the see in his absence; retired to his monastery for three years; was put in possession of the bishopric 669; was ejected by King Egfrid, who divided the diocese into three bishoprics; visited Rome for redress, and obtained the papal decision in his favor, but was imprisoned nine months on his return, and never recovered possession of his see. D. at the monastery of Oundle, Apr. 24, 709.
Revised by J. J. Keane.

Wilhead: See Willehad.

Wilhelm: the German form of William (*q. v.*).

Wilhelm, *vil'helm*, Karl: composer; b. at Smalcald, Prussian province of Hesse, Sept. 5, 1815; son of an organist; studied at Frankfort and under Spohr at Cassel; was a teacher of music in Crefeld and director of the Liedertafel 1840–65. In 1854 he composed the music to *Die Wacht am Rhein*, and when this song became immensely popular during the Franco-German war the Prussian Government gave him a pension. D. at Smalcald, Aug. 26, 1873.

Wilhelmina, *vil-hel-mee'naă*, Helene Pauline Marie: Queen of the Netherlands; only child of King William III. of Holland by Queen Emma his second wife; b. at La Haye, Aug. 31, 1880; succeeded to the throne on the death of her father 1890, her mother being regent. She was married to Prince Henry of Mecklenburg-Schwerin, Feb. 7, 1901.

Wilhelmite: See Willemite.

Wilhelmshaven, *vil'helms-haa-fen*,: a fortified seaport of Germany, on the Jade Bay of the North Sea (see map of German Empire, ref. 2–D). In 1853 Prussia bought the coast district from Oldenburg for 500,000 thalers, and it has since spent much labor and great expense in order to transform the bay into a good naval harbor. Basins, of which the largest is 420 meters long and 260 meters broad, were dug in the muddy ground of the marsh and then separated from the bay by a dam. The new harbor was first used by the navy at the beginning of the war with France. On the western side of the principal basin are three parallel dry docks, 160 meters long, which, as well as the basin, are walled with granite. To the E. this basin is connected with the bay by a canal walled with granite and provided with sluices. Besides the naval harbor there is a commercial harbor, which, however, is rather insignificant; it is not walled, has no sluiced canal, and is separated from the bay only by an earthen dam. The whole harbor is surrounded by fortifications, strongest where they face the sea, and provided with ordnance of the heaviest caliber. Since the war with France immense sums have been spent on these fortifications. The town of Wilhelmshaven has grown up since the harbor was built; it is chiefly a military colony, and has excellent barracks. Pop. 15,471.

Wilhelmshöhe: See Cassel.

Wil'ibrord, or **Willibrod**: saint: called "the apostle of the Frisians"; b. in the Saxon kingdom of Northumbria about 658, his father's name being Wilgis; was placed in childhood in the monastery of Ripon, then governed by (Saint) Wilfrid; embraced the monastic profession while very young; spent twelve years in Ireland, studying under the care of (Saint) Egbert and the monk Wybert or Wigbert, who had preached in Friesland; was ordained a priest about 689; went to Friesland in 690, landing near Utrecht, and was joined there by (Saint) Swidbert and ten or eleven other English monks; was well received by Pepin the Big, the Franconian ruler of Friesland; is said to have visited Denmark; made a visit to Rome 692; obtained ecclesiastical authority from Pope Sergius, and during a second visit (696) was ordained Bishop of the Frisians under the name of Clemens; converted large numbers of the natives by his preaching, enjoying the patronage of Charles Martel; is claimed as founder of the see of Utrecht, where he built the Church of Saint Saviour, and spent his last years at a monastery he had established (698) at Echternach, near Treves, where he died Nov. 7, 739. His festival is celebrated Nov. 6. Considerable uncertainty exists respecting the events of his career. His *Life* was written by Alcuin (d. 804) in two forms, the one in prose (13 fol. pp.), the other in verse (4 pp.); reprint by Jaffe, *Bib. rev. germ.*, vi., 39, *seq.*; Eng. trans. (London, 1877); cf. P. P. M. A. Thijm, *Der heilige Willibrord* (Münster, 1863). Revised by S. M. Jackson.

Wilk: See Whelk.

Wilkes, Charles: rear-admiral U. S. navy; b. in New York, Apr. 3, 1798; entered the naval service of the U. S. as midshipman Jan. 1, 1818. He conducted the U. S. expedition (1838–42) to explore the Southern and Pacific Oceans, a narrative of which he published (abridged ed. New York, 1851), and to the detailed report of the expedition, giving the scientific results obtained, he contributed the volumes on meteorology and hydrography. In 1861 he was ordered to the West Indies in command of the frigate San Jacinto to search for the Confederate cruiser Sumter. Learning that the Confederate commissioners Slidell and Mason were on their way to Europe in the British mail-steamer Trent, he intercepted that vessel and took from her the commissioners, whom he conveyed to Boston. This act met the approval of his department and of Congress, and the commissioners were for a time held as prisoners in Fort Warren, but subsequently surrendered by the U. S. Government to Great Britain. In 1862 he was placed in command of the Potomac flotilla to co-operate with the Army of the Potomac, but on the withdrawal of that army from the Virginia peninsula, was ordered to command the flying squadron organized for the purpose of breaking up blockade-running between the Southern States and the West Indies. Many captures were made. In July, 1866, he was promoted rear-admiral, and soon after placed on the retired list. Among his published works, other than those above mentioned, are *Western America, including California and Oregon* (Philadelphia, 1849), and *The Theory of the Wind*, with maps and charts (New York, 1856), etc. The London Geographical Society awarded him its gold medal in 1848. D. in Washington, D. C., Feb. 8, 1877. Revised by C. Belknap.

Wilkes, John: political agitator; b. at Clerkenwell, London, England, Oct. 17, 1727; educated at Hertford and Aylesbury schools and at the University of Leyden; traveled on the Continent; married in 1749 Miss Mead, a lady of fortune ten years his senior, from whom he was separated after the birth of a daughter; became colonel of the militia and high sheriff of Buckinghamshire; was elected to Parliament from Aylesbury in 1757; began in June, 1762, the publication of a weekly paper, *The North Briton*, in opposition to the administration of Lord Bute; printed in his No. 45 (Apr. 23, 1763) some comments on the king's speech on summoning Parliament which led to the issue of a general warrant for his arrest and the seizure of his papers; was committed to the Tower Apr. 30, but was soon released by order of Chief Justice Pratt of the common pleas, who decided that general warrants were "unconstitutional, illegal, and also absolutely void." The House of Commons, however, declared No. 45 of *The North Briton* to be a "seditious libel," caused it to be burned by the hangman Nov., 1763, notwithstanding a popular commotion, and passed a special law for the prosecution of its author. Wilkes meanwhile won a suit against the Under-Secretary of State for seizure of his papers, being awarded £1,000 damages, but was expelled from the House of Commons Jan. 19, 1764; was prosecuted at the instance of the House of Peers before Lord Mansfield on the charge of republishing No. 45, and also for printing and publishing an obscene poem called *An Essay on Woman*, and was found guilty of both charges by the court of king's bench Feb. 21, 1764, when, having previously fled to France, he was outlawed; returned to England in 1768; was chosen to Parliament for the county of Middlesex (including the city of London); surrendered himself to the court of king's bench; was rearrested, rescued by the mob, but went voluntarily into confinement; was the occasion, on the meeting of Parliament, of a riot in St. George's Fields May 10, 1768, in which several lives were lost, and was sentenced for his former offense to pay £1,000 fine and to imprisonment for twenty-two months. His outlawry was reversed by Lord Mansfield, but he was expelled from the House of Commons for the new offense of libeling Lord Weymouth, but was returned

without opposition at the new election. Though declared by Parliament incapable of a seat, he was three times chosen by his constituency, until, on the ground of illegality of votes cast for him, an opponent who had received but few votes was declared elected. These events caused great commotion in England; Wilkes became the idol of the people at large, being considered a martyr to the cause of liberty, received costly presents, extricated himself from bankruptcy by the aid of a subscription of £20,000, and was awarded £4,000 damages from Lord Hardwick for false imprisonment (Nov., 1769). In Apr., 1770, he was set at liberty, was chosen alderman of London, and took his seat in Parliament, where a vain attempt was made to force him to appear at the bar in the capacity of alderman. He was elected sheriff of London 1771, lord mayor 1774, in which year he was reelected to Parliament; had the resolutions of the House on the elections expunged May, 1782, and was chamberlain of London from 1779 to his death, in that city Dec. 27, 1797. He published many political speeches and pamphlets, including a correspondence with "Junius," edited *Catullus* (1788) and *Theophrastus* (1790), and left a large *Correspondence*, which was edited by Almon, with a *Memoir* (5 vols., 1805). The best of his numerous biographies are by J. S. Watson (1870), W. F. Rae (1870), and Fitzgerald, *Life and Times of John Wilkes.* Revised by F. M. Colby.

Wilkesbarre, or **Wilkes-Barre**, wilks'băr-rĕĕ: city; capital of Luzerne co., Pa.; on the Susquehanna river, and the Cent. of N. J., the Del. and Hud., the Del., Lack. and W., the Lehigh Valley, the N. Y., Susq. and W., and the Penn. railways; 18 miles S. W. of Scranton, 144 miles N. by W. of Philadelphia (for location, see map of Pennsylvania, ref. 3–H). The city extends N. and S. 3½ miles and E. and W. 1½ miles; is located in about the center of the celebrated Wyoming valley, and has 77 miles of streets, of which 8 miles are paved with asphalt, and 18 with vitrified brick, wood, or stone, 36 miles of sewers, steam-heating plant, mountain water-supply, paid fire department, and gas and electric street-lights. The public square contains 4 acres. Among the more notable public buildings are a fine city-hall, court-house, jail, two hospitals, three theaters, a Grand Army Hall, Young Men's Christian Association building, Historical Society, Osterhout Free Library, and the armory of the Ninth Regiment, N. G. P. The city contains 59 churches: 12 Methodist Episcopal, 7 Presbyterian, 5 Baptist, 8 Lutheran, 11 Roman Catholic, 3 Protestant Episcopal, 4 Congregational, 3 synagogues, 1 Salvation Army barracks, 2 Greek Catholic, 2 Reformed, 2 Evangelical. There are 20 brick and stone-trimmed public-school buildings; 8,200 enrolled day pupils, 530 enrolled night-school pupils; annual expenditure from taxation, $115,036; from State appropriation, $39,027. There are 6 parochial schools with 5,200 pupils, 1 business college, an academy for boys, and a seminary for young ladies. The charitable institutions include two hospitals, Home for Friendless Children, and Home for Aged Women. The city expenditures in 1900 were $350,000; the assessed valuation of property was $17,897,897; actual valuation, $35,795,794; net city debt, $462,243; and value of city real estate, $212,767. In 1901 there were 3 national banks with combined capital of $975,000, 2 State banks with combined capital of $700,000, and a trust company with capital of $150,000. There are 2 large lace manufactories, silk-mill, 4 foundries, axle-works, 3 locomotive and engine-shops, wire-rope works, cutlery-works, 2 immense breweries, and many manufactories of iron, steel, wood, and leather. The mining and preparing of anthracite coal for market, the business center of which is in the city, makes the greatest demand for labor, and is the foundation of the city's wealth, giving employment to about 40,000 men and boys in and near the city. The total annual output of coal here is 15,000,000 tons. The city as well as the whole valley of Wyoming is underlain with seams of anthracite coal of an average aggregate thickness of 56 feet. Wilkesbarre was settled mainly by people from Connecticut in 1769; incorporated as a borough in 1806; and chartered as a city in 1871. Pop. (1880) 23,339; (1890) 37,718; (1900) 51,721, and including the near-by boroughs, all connected by steam and electric railroads with the city, about 150,000.
Revised by Eugene T. Giering.

Wilkie, Sir David: painter; b. at Cults, Fifeshire, Scotland, Nov. 18, 1785; studied painting in the Trustees' Academy, Edinburgh, and at the Royal Academy, London, where in 1806 he exhibited his celebrated *Village Politicians*, quickly followed by *The Blind Fiddler* (1807), *The Card Players* (1808), *Rent Day* (1809), and *Village Festival* (1811), which obtained him great popularity; was chosen an associate of the Royal Academy 1809, and an academician 1811; produced during the ensuing twelve years many notable pictures, including a group of *Sir Walter Scott and his Family* (1817) and the *Chelsea Pensioners reading the Gazette of the Battle of Waterloo* (1822), executed for the Duke of Wellington, which is generally considered as the most perfect representative of his genius. Subsequently he changed his style, sought to emulate the depth and richness of the coloring of the old masters, and chose elevated, and even heroic, subjects, to the height of which he could never fully raise himself. He spent three years (1825–28) on the Continent on account of ill health, visiting Italy and Spain. But though the quasi-high art of his later years left the public rather cool, he never lost his popularity. He was made painter in ordinary to George IV. Jan., 1830; was knighted by William IV. 1836; made portraits of those sovereigns and of Queen Victoria; executed a fine painting of the *First Council of Queen Victoria*; visited Palestine and Egypt in 1840. D. at sea near Gibraltar on his homeward voyage, June 1, 1841. He made a few very beautiful etchings and dry-points. Several volumes of engravings of his best works have been issued, including *Oriental Sketches* (1843); *The Wilkie Gallery* (1850); and *The Great Works of Sir David Wilkie* (1867), with a *Memoir* by Mrs. C. Heaton. His *Life, Journals, and Correspondence* (3 vols., 1843) were published by his friend, Allan Cunningham. Revised by Russell Sturgis.

Wilkie, William: poet; b. at Dalmeny, West Lothian, Scotland, Oct. 5, 1721; educated at the University of Edinburgh; became a successful farmer; was ordained minister of the Scottish Kirk at Ratho 1753, and became Professor of Natural Philosophy in the University of St. Andrews 1759. He was the author of *The Epigoniad, a Poem in Nine Books* (1747; 2d ed. 1759), an epic upon the taking of Thebes, which procured for its author the title of the Scottish Homer, and a volume of *Fables* (1768) after the manner of Gay. D. Oct. 10. 1772. Revised by H. A. Beers.

Wilkins, John, D. D.: theologian and scientist; b. at Fawsley, Northamptonshire, England, in 1614; educated at New Inn and Magdalen Halls, Oxford, graduating in 1631; took orders in the Church of England 1635; was a zealous adherent of Parliament during the great rebellion, and signed the Solemn League and Covenant; was chiefly instrumental in forming at London in 1645 the club of scientists which became the nucleus of the Royal Society; became warden of Wadham College Apr. 13, 1648; married a sister of Oliver Cromwell 1656; was appointed by Richard Cromwell master of Trinity College, Cambridge, 1659; was ejected at the Restoration 1660; became prebendary of York 1660; obtained the favor of Charles II., who made him rector of St. Lawrence, Jewry, London, 1662; became preacher to Gray's Inn; was one of the charter members and councilors of the Royal Society 1663, and became Bishop of Chester 1668. He was the inventor of the perambulator or measuring-wheel; was a mathematician and physicist, a skillful mechanician, untiring in his experiments, a philologist of great erudition, and a noted theologian and pulpit orator. D. in London, Nov. 19. 1672. He was the author of *Discovery of a New World* (1638, treating of the habitableness of the moon and the possibility of a passage thither); *Mercury, or the Secret and Swift Messenger, showing how a Man may with Privacy and Speed communicate his Thoughts to a Friend at any Distance* (1641); *Mathematical Magick, or the Wonders that may be performed by Mechanical Geometry* (1651). His *Mathematical and Philosophical Works* were published in 1708 (new ed., 2 vols., 1802), with a *Life of the Author and an Account of his Works.*

Wilkins, Mary Eleanor: author; b. at Randolph, Mass.; was educated at Mt. Holyoke Seminary, and early removed to Brattleboro, Vt., whence she returned to Randolph in 1883. Her magazine stories, faithful delineations of New England rural life, began to attract notice about 1886. She published collections of short stories, *The Adventures of Ann* (1886); *A Humble Romance* (1887); *A New England Nun* (1891); *Young Lucretia* (1892); *Giles Cory, Yeoman*, a play (1893); *Jane Field*, a novel (1893); and *Pembroke*, a novel (1894), hitherto her most powerful and sustained work, which has been received with high praise in England as well as in the U. S. for its dramatic presentation of the pride and obstinacy hereditary in the Puritan character. In 1895 her story, *The Long Arm*, won the prize of $2,000 offered by a firm of publishers for the best detective story. H. A. B.

Wilkinsburg: borough; Allegheny co., Pa.; on the Penn. Railroad; 7 miles E. of Pittsburg (for location, see map of Pennsylvania, ref. 5–A). It has a national bank with capital of $50,000, a Protestant Episcopal parish library, and a weekly newspaper, and is closely identified with the business interests of Pittsburg. Pop. (1900) 11,886.

Wilkinson, Henry Spencer: See the Appendix.

Wilkinson, James: soldier; b. in Maryland in 1757; joined the Revolutionary army and in Jan., 1778, was appointed secretary of the board of war, of which Gates was president. A quarrel arising with the latter at the time of the Conway cabal, Wilkinson resigned his secretaryship, and in July, 1779, was appointed clothier-general of the army. He settled in Kentucky after the peace, and engaged in mercantile affairs. He commanded an expedition against the Wabash Indians 1791–92; was promoted to be brigadier-general Mar., 1792, and commanded right wing of Wayne's army at Maumee Rapids. Dec. 15, 1796, to July 13, 1798, and June 15, 1800, to Jan 27, 1812, he was general-in-chief of the army, serving on the Western frontier; one of the commissioners to receive Louisiana from the French in 1803, he was Governor of that Territory 1805–06; ordered to command on the Mississippi Dec., 1808, he was recalled to Washington in 1810, and tried by court martial in 1811 on charges of corruptly receiving money from Spain and being in complicity with Aaron Burr. The court acquitted him with credit, and he returned to the Southern department. In 1813 he was appointed major-general, and transferred to the Northern frontier. His plans for the occupation of Canada totally failed. He was superseded in command, but a court of inquiry ordered in 1815 acquitted him of all blame. On the reorganization of the army in 1815, he was discharged, and passed the later years of his life upon his estates in Mexico. He published *Memoirs of My Own Times* (3 vols., Philadelphia, 1816). D. near the city of Mexico, Dec. 28, 1825. See Gayarre's *Spanish Domination in Louisiana* (New York, 1854) and Gilmore's *Advance Guard of Western Civilization* (1887).

Wilkinson, Jemima: religious leader; b. at Cumberland, R. I., about 1753; educated as a Quaker; recovered from a severe fever, attended by an apparent suspension of life, 1773, after which she asserted that she had been raised from the dead to instruct mankind; professed to work miracles, and made proselytes, with whom she settled (1789) on a tract of 14,000 acres in the present town of Torrey, Yates co., N. Y., where a village named Jerusalem was built. D. there July 1, 1819. At her death the sect was entirely broken up. See D. Hudson, *History of Jemima Wilkinson, a Preacheress of the Eighteenth Century* (Geneva, N. Y., 1821); and *Memoir of Jemima Wilkinson . . ., containing an Authentic Narrative of her Life and Character, and of the Rise, Progress, and Conclusion of her Ministry* (Bath, N. Y., 1844). Revised by S. M. Jackson.

Wilkinson, Sir John Gardner, F. R. S., D. C. L.: Egyptologist; b. at Haxendale, Westmoreland, England, Oct. 5, 1797; son of Rev. John Wilkinson. He was educated at Harrow School and Exeter College, Oxford, and in 1821 went to Alexandria. During a long residence in Egypt he made a complete survey of the country and became acquainted with its antiquities. The results of his labors were embodied in his various works, but principally in his *Manners and Customs of the Ancient Egyptians*, which is still valuable for its numerous illustrations and archæological material. It was reissued in a new and revised edition by Dr. Samuel Birch in 1879. Wilkinson was knighted in 1839. His collection of Egyptian, Greek, and other antiquities, together with his collection of coins and medals, are preserved at Harrow School. D. at Llandovery, Wales, Oct. 29, 1875. A list of his works includes the following titles: *Materia Hieroglyphica* (Malta, 1828); *The Topography of Thebes and General View of Egypt* (1835); *The Manners and Customs of the Ancient Egyptians* (2 series, 6 vols., 1837–41; 3d ed., 5 vols., 1847); *Modern Egypt and Thebes* (2 vols., 1843; 2d ed. 1844, republished as Murray's *Handbook for Travelers in Egypt*, 1847; new ed. 1857); *Dalmatia and Montenegro* (2 vols., 1848): *The Architecture of Ancient Egypt* (1850); *The Fragments of the Hieratic Papyrus at Turin* (1851); *A Popular Account of the Ancient Egyptians* (1853); *The Egyptians in the Time of the Pharaohs* (1857); *On Colour* (1857); and contributions to Rawlinson's *Herodotus* (1858–60; revised 1876). A memoir was published by his widow in 1876. C. R. G.

Wilkinson, William Cleaver: See the Appendix.

Will: that function of the mind which manifests itself in action or conduct. The word voluntary is used only of acts which proceed from the will. The theory of the will is one of the most important divisions of human psychology; for according as human action is construed, its relation to the mechanical processes of the brain (its so-called freedom), the influence of one person upon the conduct of another, etc., the whole philosophy of life with its responsibilities, duties, etc., takes on one form or another.

History of the Theory.—The Greeks can not be said to have worked out a doctrine of the will before Aristotle. This great thinker, however, noticed facts and made distinctions which now rest at the basis of the most thoroughgoing analysis of the voluntary life. Aristotle divided the mental powers or faculties into two great classes—those which belong to the receptive side of the soul's life, the cognitive; and those which manifest the soul in action, the motive, faculties. Under the latter head he included not only all that is covered by the words will, volition, and the like, but also the emotional life, holding that it is the function of emotion to excite to action. Another important doctrine of Aristotle's was his subtle distinction between will in its generic sense and volition in its special sense—a distinction which is now current in the psychologies. Aristotle was the first also to lay the basis of ethics distinctly in the psychology of the will, reaching a doctrine of the freedom of the will from which modern thinkers freely draw.

In the Middle Ages philosophy was narrowly theological, and the will held a prominent place; this the more since the philosophy of Aristotle dominated all attempts at original thought. Controversy waged mainly about the problem whether the human soul had freedom "by nature" or only "by grace." It was not until the awakening of philosophy in Descartes and the inductive thinkers in Britain that the actual nature of the mind began to be studied for itself.

Even when philosophy became more independent and aware of her own problems, the start toward a theory of the mental life was extraordinarily mistaken. The theory of knowledge became, in all countries where philosophy sprang up, the one problem, so much so that the history of modern philosophy is largely a history of theories of knowledge. Kant asked the question, "How is knowledge possible?" a question which had been asked for a hundred years both in England and France; but the corresponding question, "How is action possible?" was either not asked at all or answered by corollaries from some theory of knowledge. The truth of this statement may be seen by examining the table of contents of the great works on philosophy which have been produced even up to 1850. The neglect of the will has worked two mischievous results—apart from the impoverishment both of philosophy and of life—i. e. the will has been left to the more dogmatic treatment of the theologians, who have found it necessary to bring to it certain theological presuppositions; and, in the second place, the breach between philosophy and theology has been widened since modern psychology has given to philosophy a more adequate theory of action than that on which theology has based some of her important doctrines.

The endeavor to introduce the data of the active life into philosophy, however, did not come from psychology, in the first instance, but from certain philosophers who were impressed with the lack of touch of the older intellectual schemes with the real problems of life. In Germany the attempt was made by Schopenhauer and his followers, especially von Hartmann, to construct a philosophy, not upon the function of knowledge alone and its criticism, but upon the fundamental active tendencies of human nature. Will was made the one potency of animate life; the very impulse to know, a manifestation of will; and the category of action, the final term of explanation. Before this there had been desultory attempts to find a place for will in the theory of the world; such were all those theories which held that in the consciousness of volition or effort we have immediate knowledge of the soul as an independent essence—the view of the French spiritualists, Royer-Collard, Maine de Biran, Jouffroy, etc., and the Scottish philosophers Reid, Brown (though these in less measure). But these attempts were too superficial or too eclectic to have permanent influence.

It was therefore in part, at least, through the influence of the Schopenhauer philosophy that the will has become one of the leading topics and the point of freshest analysis in the whole range of modern psychology. It is also a leading task of philosophical theory to compromise with Schopenhauer by making the notion of activity one of the basal

concepts of thought. The theism of the present is trying to incorporate into the traditional arguments considerations drawn from the psychology of the will.

Genesis of Volition.—The attempt to find the place of volition in the general theory of the rise and development of the child's faculties has given rise to much discussion. Bain's view may be taken as typical of the class of views which make volition an affair of relative complexity in the ordinary associative processes of consciousness. Certain kinds of action come to be associated with various pleasure-giving experiences; and the subsequent voluntary performance of the same movements is secured by this association, and they are performed for the sake of the pleasure. So also Spencer and the later associationists generally. The sense of effort, on this view, is an incident of complexity of sensation. Other theories which account for volition in terms of compounded and associated sensations—i. e. Preyer's—differ only in the details of the elements involved, and the order in which these elements take their rise in the infant's consciousness. Another group of theories, holding equally to the genetic or "natural history" view of volition, find the origin of this function on the active side of the mind. These men—i. e. James, Münsterberg, Baldwin—locate the first exhibition of volition in the attention, and reduce the problem to that of the rise of so-called "voluntary attention." On this view the will is a matter of successful synthesis of elements, sensational and other; and the analysis of the experiences of effort, etc., is largely a search for the elements, in any particular case, which enter into the synthesis of attention. The view which finds attention a matter of relatively constant tension or strain, therefore, thinks it has accounted for volition only when it has traced the rise of attention in the child, and also its place in the race history of mind. This class of views finds the fact of volition a case of the larger phenomenon of mental accommodation, and so finds its genesis in the child in connection with those muscular experiences, i. e. random movements (in common with Bain, Preyer, etc.), suggestion (Guyau, Janet), imitation (Baldwin), by which accommodation in general proceeds. Another class of thinkers hold that the phenomenon of volition is a purely spiritual affair, and deny it a natural history in the sense explained. With them are the philosophers (i. e. Wundt) who carry the concept of will back of volition to include the active side of consciousness everywhere, and so hold that no analysis of effort throws any light upon the real genesis of it.

Analysis of Volition.—Coming to the full-fledged experience of volition or choice, certain profound questions confront the psychologist. If we ask what is actually in the mind at the very moment of a hard-fought choice or mental decision, we again find various views on what seems so simple a matter of description. The older schools held to one of two positions respectively. One class (again mainly the associationists) said that what was in consciousness then could be described thus: A conflict of motives was going on analogous to the play of forces in any case of complex action of forces in the physical world. The outcome, in one case as in the other, must be a resultant of the various forces—that is, the strongest or controlling motive would win, and action on this motive would follow. This view was—and is—supported by all the evidence from pathology which shows that a motive may become so imperative—an idea so "fixed"—that no effort or persuasion can prevent action upon it; also by the force of the analogy from the physical forces, represented in this instance by the processes in the brain which accompany the mental experience of volition.

The other answer to the question runs thus: The experience of volition is not exhausted by a statement of the motives which are appealing at the time to the agent. He is conscious behind it all that he is weighing these motives and coming to a decision upon their relative value to him; this consciousness is evidence that the analogy of the play of motives to that of physical forces is false.

The newer insights of psychologists are restating both of these positions. Those who refuse to recognize the force of the physical analogy are nevertheless yielding the point that analysis is exhausted in the statement of the actual play of the so-called motives to conduct; but, on the other hand, the associationists are having to enlarge the concept "motive" to include a great variety of influences which can not be clearly stated in terms of the physical analogy, i. e. the so-called sub-conscious, the influence of suggestion, social and other. This increasing *rapport* is influential in bringing the differences of psychologists to a minimum, and, on the other hand, in throwing the question of interpretation over into metaphysics. How far the physical analogy can be forced upon mental facts is a question for philosophy to decide, and those who discuss it are becoming more and more disposed to interpret even the play of the physical forces in terms of mental process, or at least to hold to a theory which preserves the relative autonomy of both kinds of reality.

Moreover, although psychology finds no reason to admit in its analysis any elements other than those of content, yet it finds the changes of content governed by a principle or law which seems to be different from that of the composition of forces. This principle is known as that of synthesis or APPERCEPTION (*q. v.*). Each new pulse of thought seems to have a unity of its own, and while the elements of earlier mental states may sometimes be detected in it, yet the unity is that of a function, itself complete and indivisible. For this reason psychology is constrained to ask for some adequate explanation of the unity and continuity of the mental life before it gives up the contention that mental reality is both as valid as physical, and furnishes—when supported by the considerations due from metaphysics—as good an ultimate category of explanation of existence in general. This is especially pertinent in the matter of volition. For here the unity of outcome is so obtrusive that the ordinary man is startled when he hears any doubt thrown on the independence of his relation to the alternatives which appeal to him for choice. He fails to see how he, the actor, can be identified with the actions which he is thinking of performing.

Freedom of the Will.—We now see to what narrow margins of interpretation the time-honored question of "freedom" is confined by modern psychology. If we admit—as the foregoing considerations lead us to admit—that (1) there is no choice but what is confined to the elements or motives at the time in consciousness, and (2) the agent as such has no power to make for himself new motives, and (3) that the synthesis which follows and is called choice is always the forming of a new mental unit out of these old elements—then we must admit certain facts about freedom. (1) A man is free in the sense that nothing forces his choice. This is only to deny the resultant theory based on the physical analogy. But (2) the agent is nothing apart from the motives which come up in his consciousness and stand for his character; and so by a fair interpretation his synthesis or choice is conditioned upon these elements. Choice, then, is always conditioned; if the conditions, the motives, the character, were different, then the choice would be different. To say that the agent is capable of acting outside of these conditions is to say that he can be somebody else. But yet he is not caused. To say that he is caused or forced is to say that the only way that a series of conditions in the world can operate is under the law of conservation of energy or composition of forces. This is to make the mechanism of the physical laboratory the final explaining category of reality. The final form of statement therefore of the question of freedom is this: How can a phenomenon be *conditioned* upon a group of earlier phenomena, and yet not be *caused* by them? The difficulty which some have in conceiving that inviolable conditions do not mean in all cases causation arises from the mental habit which we all acquire of identifying all cases of unbroken sequences in time, and even logical sequences as well, with the particular series of events in nature upon which the notion of physical causation rests. But an adequate analysis even of these series of sequences shows difficulties in the way of considering the so-called necessity that an effect be explained entirely in terms of its cause as an ultimate fact. The effect, no less than the cause, may have some deeper guarantee in the nature of things; and with this admission we open the door to a possible recognition of the kind of union spoken of as mental synthesis as a candidate for "ultimate" honors. Lotze seems to have some ground for thinking that the only analogy we have to rationalize physical causation by is to be drawn from the unity which shows itself in consciousness beneath complexity of content, and through the temporal sequences which make up the stream of thought.

Psycho-physics of Will.—Another great question which modern psychology asks of all the mental functions is that covered by the general word psycho-physics, i. e. the question of the physical process which goes on in the brain during the continuance of the mental function in question.

This question assumes very great importance, in the case of volition, since here the metaphysics of the relation of mind and body comes into prominence. If we are to hold that there is any interaction of any kind between the two kinds of existences—any interchange of energy—here is the place to look for it, here in the voluntary management of the movements of the body by the agent. Historically the modern discussion of this question began with Descartes, who propounded the famous doctrine of "occasional causes," especially to meet this case. This doctrine holds that the will to move the hand is not the efficient cause of the actual movement, that there is no passing of energy from the mind to the body, but that the act of volition is only the "occasion" upon which the discharge of the energies of the brain go forth. The further question as to what arrangement must subsist between the two in order that this occasion may be just the occasion requisite and no other, led to two further positions. The doctrine of "pre-established harmony" was developed by Descartes's disciples; it held that the arrangement whereby the mental volition was the occasion of just the right movement and no other was one pre-established between two independent substances from their creation, and to extend for all time. The other doctrine inspired by the position of Descartes is that the mind in volition does not increase or decrease the amount of physical energy disposable in the brain for movement, but only directs it into one channel rather than another. The mind, by thus directing the discharge of energy, decides what movements of the body shall take place.

The theory of "pre-established harmony" is not now widely held in the dualistic form presented by Descartes, but it is widely prevalent in the doctrine which goes under the name "double-aspect theory." According to this theory—held by men who wish to avoid metaphysical discussion and to restrict themselves to the facts on both sides—the series of mental changes found in consciousness on one hand, and the series of physical changes in the brain on the other hand, may be considered as two independent sets of events, each set pursuing its own course, and not interfered with by the other. This assumes, of course, that since certain mental determinations—as the volition to raise the right hand—is always accompanied by the actual rise of the hand, this concomitance must in some sense be the result of prearrangement, even though there be no intelligence involved in it. The second view of the two referred to—i. e. that the will has a directive office in connection with the discharges of brain energy—is mainly held by those who are concerned to maintain a dualism in philosophy. It is openly fallacious, however; for it is plain that force can not be directed into one channel rather than another without doing work—i. e. removing a resistance, etc.—in the system of forces in question; but to say that the will can do this is to say that it can put forth physical force, and that is the original view which the theory of "direction" is intended to supersede.

The later theories of the psycho-physics of will may be divided into two types: 1. Theories which frankly rule out the mind considered as an independent kind of existence, or even as a sort of existence which has any laws of action of its own apart from the processes of the brain. This general view is called the "epi-phenomenon" theory, since it considers consciousness merely as an added phenomenon, a piece of by-play to the material processes going on in the brain. It is the position in psychology which is demanded by a thoroughgoing materialism in philosophy. 2. The other class of views holds to the relative phenomenal independence of both mind and brain, recognizing that if laws of action are formulated for the behavior of material bodies—the laws of mechanics, chemistry, etc.—solely from the facts of observation of the material world, then there is the same reason and justification for the formulation of laws of the behavior of mind, the laws of association, apperception, etc., solely from the facts of observation of the events which take place in consciousness. This leads to the recognition of the law of conservation of energy in the brain at the same time that the mental stream of events is held to pursue its own course under laws of its own. The further question as to how these two systems of events are, or came to be, in harmonious relation to each other, that is left to the metaphysician. He, in turn, may hold the dualism to be ultimate, or he may, by a line of argument which is not in place here, show that the laws of mind are really immanent in the external world, and constitutive of it. See PSYCHOLOGY and PHILOSOPHY.

J. MARK BALDWIN.

Will (or LAST WILL, or TESTAMENT): a formal act or instrument whereby a person disposes in whole or in part by anticipation of the property which he shall leave at his death. Such an act, in order to be properly described as testamentary, may or may not be revocable at the pleasure of the testator, though its revocable or "ambulatory" character is perhaps the most obvious and important feature of the English and American will, but it has the invariable characteristic that it will not take effect and thus operate to transfer the property of the testator until the death of the latter. This has not always and everywhere been the case, however, the will in its primitive form having sometimes been nothing more than a present alienation of property in contemplation of death, the donor perhaps reserving certain rights of user and enjoyment in the property in the event of his recovery.

Origin and History.—The right of testation is by no means inherent in or essential to the existence and due recognition of property rights in general. Although the practice of allowing the owner of property in some measure to direct its disposition after his death is of very ancient origin, it is even in its most restricted form a comparatively late development out of the conception of the right of private property, while in the comparatively unrestricted form in which we know it the practice is of very recent origin. The right of testation, like that of free alienation, has been won only slowly, and is wholly the creature of positive law. Indeed, the history of human society shows that among most of the civilized races there have been long periods of time during which the right of alienation, including that of testation, was regarded as incompatible with the right of property as that was understood. In those primitive communities in which the patriarchal system prevailed property was conceived of as belonging in a sense to the family and not absolutely to the patriarchal head of the family. The right of intestate succession, of heirship, was thus established long before that of testation, and the will in the modern sense of the term, as a disposition of property outside the regular and lawful line of succession, was long regarded as an encroachment upon the rights of the lawful heir. The true historical and legal view of succession therefore differs widely from the popular view. According to the latter, it is the duty of every prudent citizen who has any property to leave at his death to dispose of the same by will, the statutes of descent and distribution being intended only to carry into effect in a general way the intentions of those who die without having made such disposition. From the legal point of view, however, intestacy and inheritance by operation of law are the normal state of affairs.

According to the best modern authorities the right of testation existed in a qualified form in ancient Egypt as early as the fifteenth century B. C., but it did not appear in Greece before the time of Solon, nor is there any evidence of its legal recognition in Rome before the Twelve Tables. It did not exist among the Hindus (except perhaps in Bengal) before the English conquest, nor in any but the most rudimentary form among the ancient Hebrews. There is no trace of the will in the codes or customs of the barbarian conquerors of Rome. As Sir Henry Maine has pointed out, "to the Romans belongs pre-eminently the credit of inventing the will," an institution "which," he declares, "next to contract, has exercised the greatest influence in transforming human society." But, as he also shows, this very Roman testament from which all modern wills have sprung, originally performed very different functions from those which have attended it in more recent times. "It was at first not a mode of distributing a dead man's goods, but one among several ways of transferring the representation of the household to a new chief." (Maine, *Ancient Law.*) Indeed, it is not until the end of the Middle Ages that wills become a recognized device for diverting property from the family and of distributing it according to the fancy of the owner. But the law has never in any age or country allowed free and unrestricted range to the testator's will. He has always been more or less fettered in the testamentary disposition of his estate by considerations of public policy and the rights of the family to which reference has been made above, and it seems unlikely that the process of emancipation which has removed most of those restrictions will go much further. Indeed, so far as present indications show, the tendency to free testamentary alienation seems for the present to have been completely checked by those conservative instincts of society to which the modern democratic *régime* is giving legal expression, the interests of the

family on the one hand and those of the community at large on the other being equally guarded by recent legislation in England and the U. S. Instances of this legislation will be found in the last subdivision of this article.

GEORGE W. KIRCHWEY.

ROMAN AND MODERN EUROPEAN LAW.—In early Roman law it seems that patricians, at least, could obtain some modification of the law of inheritance, as far as their estates were concerned, by means of private bills, passed by the patrician assembly. The ordinary testament of the republican period, however, was originally a conveyance of the entire estate, with the understanding that the conveyee should not enforce his right during the life of the conveyor. The forms observed were those of "mancipation" or sale, which required the presence of the conveyee, a scale-holder, and five witnesses. Such a conveyee might, however, be charged with a trust; and by substituting for the heir a purely fiduciary conveyee, whose instructions were written in sealed tablets, the conveyance became simply a mode of giving effect to the last will of the testator. The conveyee and the scale-holder gradually sank into the position of ceremonial figures like the witnesses; and the ordinary testament of the later Roman law was simply a written instrument signed by the testator in the presence of seven witnesses and signed and sealed by these witnesses. Imperial legislation introduced several other forms of testation, some of which (e. g. the testament intrusted to the local court of first instance and made a part of its records) have passed over into modern European legislations. The modern codes have established still other forms. One of the most important of these is the so-called holographic testament, which is written out in full by the testator with his own hand, is signed and dated by him, and is valid without calling in witnesses or observing any further formality.

Heirs and Legatees.—In accordance with its theory of universal succession (see SUCCESSION), the classical Roman law required that the testator's estate should be bestowed as an entirety upon one or more heirs. These could be charged with the duty of delivering to other persons special things or paying to them definite sums, but all such bequests or legacies implied the previous appointment or "institution" of an heir, and became effective only when he became owner of the inheritance. The testamentary heir thus combined the powers and duties of a modern executor, with the rights of a residuary legatee. By the *lex Falcidia* (40 B. C.) it was provided that, after the debts of the estate had been paid, the heir should retain, as against the legatees, at least one-fourth of the inheritance. In the imperial period it was recognized that bequests made in precatory form (*fidei commissa*) were enforceable, and that such bequests might transfer the whole estate. (The heir, however, retained, in such a case, the "Falcidian fourth," unless the testator expressly provided to the contrary.) It was also recognized that bequests might be made in a less formal codicil, executed later than the formal testament; and it was decided that even where no testament had been made, bequests might be made by codicil, and that such bequests were binding upon the intestate heirs (the so-called intestate codicil). The effect of these changes was to make the distinction between inheritances and legacies, on the one hand, and between testaments and codicils, on the other, of little practical importance. In modern European law these distinctions have become still fainter. Testament was unknown to the Teutonic peoples, and was introduced into Northern Europe by the Roman Church; but even in the ecclesiastical practice the Roman testament was modified by Teutonic ideas, and further changes have been introduced by modern legislation. In the majority of European countries to-day a will made up entirely of special bequests is not necessarily regarded as an intestate codicil, nor does its execution necessarily devolve upon the intestate heirs. Provision may be made, as at English law, for the payment of the debts and bequests by special executors.

Capacity.—At Roman law nearly all persons of sound mind and above the age of puberty could dispose of their property by testament. At modern European law minors have not, as a rule, full powers of testation. At French law, for example, a person under sixteen can make no testament; a person over sixteen and under twenty-one can dispose, by testament, of only one-half of the amount which he might bequeath if of full age. A general capacity of taking by testament is attributed to natural persons; but juristic persons (corporations, foundations) can take only by virtue of express legal authorization.

Limitations.—At classical Roman law the power of the testator was theoretically unlimited; he might will away all his property from his next of kin, even from his children. The only restriction imposed was that children must be expressly disinherited, not merely passed over. In practice, however, a testament which carried the entire property out of the family was easily overturned as "undutiful." Imperial legislation afterward established the rule that a testator could not will away all his property from descendants or parents him surviving. A quota was reserved for them, one-third or one-half of the estate, according to their number. Modern codes contain similar rules, at least as regards surviving descendants. The *Code Napoléon*, which goes furthest in this direction, reserves for a single child one-half of the estate; for two children, two-thirds; for three or more children, three-fourths. If there are no descendants, one-half of the estate is reserved if there are ascendants in both lines, and one-fourth if there are ascendants in either line. Some of the European codes also create a reserved share for the surviving husband or wife.

In the French law these protected persons are really the heirs in the Roman sense; the whole estate vests in them, and the person to whom the free share of the estate is left, *à titre universel*, is really only a legatee. In the Austrian code, however, and in the German draft code, the estate vests in the testamentary heirs, and the reserved portion is recovered from them as if it were a debt owed by the estate.

All of these persons, however, to whom a share is reserved may forfeit it by gross misconduct. The grounds upon which they may be disinherited are specifically set forth in each of the modern codes. For literature, see SUCCESSION.

MUNROE SMITH.

ENGLISH AND AMERICAN LAW.—The will of the English law, notwithstanding its derivation from the Roman testament, differs widely in conception, form, and effect from the latter. The beneficiaries under it are not the testator's heirs; they do not succeed to his entire inheritance as such, but only to such specific gifts or separate amounts as he bestows upon them individually; they do not become liable for his debts, but the personal estate, which devolves primarily upon the executor, and the real estate, which vests under the will in the devisees to whom it is given, constitute in law separate funds (known respectively as personal and real assets) for the payment of the testator's debts. The legatees of personal property derive their title not directly from the testator, but from the executor, who occupies a representative character closely analogous to that of the Roman heir. (See SUCCESSION.) It was doubtless in virtue of this representative character, and not as a specific legatee, that the executor of the English law was anciently entitled to the undistributed residue of the personal estate. The continuity of person, which was preserved in Rome by personifying the inheritance in the interval between the death of the *pater familias* and the accession of the heir, is secured in English law by the fiction that the appointment of the executor relates back to the date of the testator's death. (Holmes, *Common Law.*) These points of similarity between the English executor and the Roman heir are clearly traceable to the ecclesiastical tribunals in which the English law of wills was developed. While the law administered in those tribunals was avowedly a part of the native common law of the English people, yet, being expounded and applied by men who, for the most part, had no common-law training and whose learning was that of the Romanized canon law (the bishops, or "ordinaries," and their delegated officers), it was naturally and perhaps unconsciously moulded into forms resembling those of the Roman law. While it was only the characteristic English will—i. e. the will of personal property—which came within the ecclesiastical jurisdiction, that jurisdiction survived in all cases affecting the personal estates of deceased persons, through all changes in the power and authority of the Church, down to the reorganization of the judicial system of England after the middle of the nineteenth century.

The English law of wills, as thus developed, prevails today in the several U. S. as well as in Great Britain and her colonies. The only important exceptions are Scotland, the State of Louisiana, and the Province of Quebec, in which the civil law of Rome continues, with some modifications, to regulate the right of testation. Mexico and the rest of the Spanish-American states also generally follow the Roman law. In Louisiana and Quebec the law is contained in civil codes based on the *Code Napoléon*; in England and

the U. S. generally it is embodied in statutes in which the nature and extent of the right, the manner in which it must be exercised, and the persons who may exercise it, are explicitly set forth. The English legislation on the subject runs back to the 27th Hen. VIII. (A. D. 1535), and is comprehensively summed up in the existing Statute of Wills, passed in 1837 (1 Vict., ch. 26). It is this prevailing English and American doctrine of wills which is expounded in the following subdivisions of this article.

What may be given by Will.—Personal property has always been subject to disposition by will. The principal restrictions with which this right was guarded in early English law are described in the article SUCCESSION (*q. v.*). These restrictions upon the bequest of personal property have long since disappeared from our law, and the owner of such property may now, as the popular expression is, "disinherit" those of his own household and lavish his estate upon strangers. Some States of the U. S. furnish an exception to this rule, however, by virtue of legislation securing to the widow an interest of one-third in the personal estate of which her husband dies possessed. In the same category should perhaps be placed the statutes which have been enacted in many of the States, making void devises to charities in excess of one-third or one-half of the estate of a testator who leaves wife or children, though there is nothing in this legislation to prevent a total diversion of the estate to stranger beneficiaries who do not come under the description of charities. In the law of Louisiana and of Quebec, on the other hand, the principle of *rationabiles partes*, which prevailed in the early English law, is fully recognized, and the testator who has children is restrained from disposing of his whole estate. One child may claim one-third of the inheritance, two may claim half, and three are entitled to two-thirds, as their *légitime*, or reasonable share, of the estate.

It seems also to be clearly established that in the era antedating the Norman conquest real property could also in many cases be disposed of by will. This was certainly true of those *boclands*, the "boc" (book or charter) conferring which expressly granted the right to devise the same, though it was probably not true of allodial holdings generally. But the rapid development of the feudal system after the Conquest speedily abolished the right of devising freehold estates, and, excepting in a few localities, where local usage was strong and tenacious enough to withstand the feudalizing process successfully, this continued to be the rule of English law for upward of four centuries. Of course, this had no application to leasehold estates, which, being relegated to the position of personal property, could be freely bequeathed as such. See LANDLORD AND TENANT, PROPERTY, and TENURE.

The way in which the doctrine of uses and the practice of conveying lands to one person for the benefit and use of another affected property rights, and especially the transfer of substantive rights in real property, is explained in the article USES (*q. v.*). Notwithstanding the incapacity of real property to pass by will, the "use" of such property might be freely devised by any one in whom it was vested, whether he was also holder of the legal title or not. It was mainly in order to remedy and prevent this manifest evasion of the law forbidding the devising of real property that the Statute of Uses was enacted in 1535 (27 Hen. VIII., cap. 10). But the practice of thus indirectly and surreptitiously devising lands had become too firmly intrenched to be done away with, and only five years after the Statute of Uses (1540, 32 Hen. VIII., cap. 1) the first English Statute of Wills was enacted. This made possible the devising of certain kinds and portions of lands held by free tenures, and subsequent legislation speedily extended the right so as to include all lands that were held in fee. To-day all real property may, under certain restrictions, be as fully and freely transferred by will as personal property. The most important exceptions are those created by the statutes of mortmain, which prohibit a gift of lands to corporations unless they are expressly empowered by statute to receive devises; those created by statute in England and in many of the American States, which in various forms and with much diversity of detail limit the power of testators in respect to the time and amount of their testamentary gifts to religious or charitable institutions and for distinctly religious or charitable purposes; and that—by far the most important one in the U. S.—which prevents a husband from depriving his widow of her dower or its equivalent. To these should be added the restriction contained in the homestead laws which have been enacted in some States of the U. S., which make void a husband's devise of homestead lands.

In whose favor Wills may be made.—Beyond the excepted classes last enumerated, the law places no limitation upon the capacity to receive testamentary gifts. Wills may be made in favor of, and property real and personal may be bequeathed to, all persons, whatever may be their disabilities to perform any positive act which shall be legally binding, including married women, infants, lunatics, idiots, persons of unsound mind, and the like, as well as all those in the full possession of their mental faculties and in the enjoyment of all the legal rights belonging to manhood.

By whom Wills may be made.—As a general proposition, all persons are empowered to make a valid will except those disqualified through lack of the requisite age, through coverture, or through mental incapacity. (1) *Age.*—The statutory rule is almost universal that a person must have attained the age of twenty-one years before he or she can make a will of lands, and the same age is frequently, and perhaps generally, required for a will solely of personal property. In New York males of eighteen and females of sixteen are competent to bequeath personal estate. In Connecticut, California, and Nevada both males and females, and in Vermont, Maryland, and Illinois the females, acquire the full testamentary capacity in respect of lands as well as chattels at the age of eighteen. (2) *Coverture.*—Formerly the law denied to married women any testamentary power over lands, and admitted only a partial authority in the bequest of personal estate. Recent legislation in the U. S. (see MARRIAGE and MARRIED WOMEN) has to a very great extent removed these restrictions, and has clothed married women with the same power to devise and bequeath their separate property as that held by single women. (3) *Mental Incapacity.*—It is a fundamental doctrine that a sufficient mental capacity in the testator—that is, sound and disposing mind and memory—is essential to the validity of any will. This rule excludes idiots, lunatics—unless the instrument is executed during a lucid interval—persons completely intoxicated at the time of the execution, and persons of unsound mind or weak mind to such degree that they are unable without assistance to call up to memory the property which they possess or the individuals who would naturally be the recipients of their bounty, or to comprehend without prompting the nature of the act in which they are engaged while making a testamentary disposition. A will is also invalid when procured by fraud, or by undue influence exerted upon a testator of enfeebled mind and memory, even though he might possess a sufficient testamentary capacity if left to exercise his own judgment unforced by the external pressure.

The Form and Execution of Wills.—Formerly all wills of personal property as well as those testamentary dispositions by which the use of lands was transferred were oral, and the first Statute of Wills (1540), which for the first time made real property devisable, while it required a writing (but no signature or formal execution) for a devise of lands, made no change in the will of personal property. It is certain that it became customary for testators at an early period to commit their testamentary intentions to writing, but this did not become obligatory in the case of wills of personal property until the enactment of the present Statute of Wills, already referred to (1837). The existing legislation, both in the U. S. and in England, concerning the form and execution of wills, is constructed upon the same model, applies alike to wills of real and of personal property, and differs only in minor points of detail. All wills, except in the single case to be mentioned hereafter, must be in writing. The following formalities must be observed in order that the execution—the *factum*—may be complete: (1) The instrument must be subscribed or signed at the end by the testator, or by some one in his presence and by his direction. In some of the States the statutory language still remains "signed" without the words "at the end," and this, it has been decided, is complied with wherever in the instrument the signature appears, even at the commencement. (2) The signature must either be affixed, or must be acknowledged by the testator to be his own, in the presence of each of the witnesses. (3) The testator must declare the instrument to be his last will in the presence of each of the witnesses. This step, which is technically termed the "publication," is of the utmost importance, and was borrowed directly from the Roman mode of execution. (4) There must be a certain number of witnesses, who act as

such in all that they do at the request of the testator, which request may be made by him personally or by some one in his presence. In most of the States the required number is two, but in some it is three. (5) These witnesses must all sign the will at the end thereof, usually in the presence of the testator; some of the statutes add that the witnesses shall sign in the presence of each other. If the testator's name is written by an amanuensis, it is often required that he should be one of the attesting witnesses. While all these five steps are necessary to the validity of a will, a substantial compliance is sufficient. A *codicil* is an appendix annexed to the main will after its execution, whereby the testator makes some change in or addition to his former dispositions, and it must be signed, published, and attested in the same manner as the original. Verbal or *nuncupative* wills are, by the existing legislation in England and in a great majority of the American States, permitted to be made only by soldiers in active service during war and by sailors while at sea; in a very few States, however, the privilege is extended to all persons *in extremis* in respect to a limited amount of property. The statutes authorizing nuncupative wills contain various provisions intended to prevent imposition or mistake, by requiring a certain number of witnesses, and frequently that the testator's declaration should be reduced to writing and attested within a short time after his death—generally thirty days—and that the will itself must be offered for probate before the expiration of a limited period from its execution, often fixed at six months.

Revocation.—The revocation of a will may be express or implied. (1) *Express.*—As the statutory law requires that the intent of the testator in the execution shall be manifested by a compliance with certain fixed formalities, so it demands that the contrary act shall be done in a manner which leaves no doubt as to his real purpose. An express revocation may be affected by a subsequent will, which in plain and absolute terms annuls any and all former ones, or which, without such formal clause, disposes of all the estate in manner inconsistent with the prior bequests. It may also be made by the destruction or cancellation of the instrument, if done by the testator himself or under his direction with the intent thereby to revoke—*animo revocandi.* The statutes often enumerate the modes, as burning, tearing, obliterating, canceling, and destroying. (2) *Implied.*—An implied revocation is wrought by the subsequent marriage of the testator and the birth of children, or by either. A will made by a single woman is annulled by her marriage. In the greater number of the American States the will of a man is revoked by his subsequent marriage and the birth of children for whom it makes no provision. In England and in some of the States the same effect is produced by the marriage alone. In a very few States the implied revocation results from the subsequent birth of a child or children who are left unprovided for by the testator. As a general rule, however, such children receive the portions to which they would have been entitled had their father died intestate, and the will stands, subject to the necessary deduction from its bequests.

Gifts causa mortis.—Gifts of this nature, being essentially testamentary in character, really constitute a sort of informal will, free from the technical and sometimes inconvenient requirements of the statutes governing the execution of formal testaments. They constitute a considerable though legitimate infringement upon the statutory law of wills, and are apparently a survival of the ancient practice of bequeathing chattels without formal act or instrument. Such a gift can be made only in contemplation of death. It has this in common with the gift *inter vivos* that it is not consummated without such delivery as would suffice to pass the legal title, but, like the testamentary gift proper, it is revocable at the pleasure of the donor, and is revoked *ipso facto* by his recovery from the illness which occasioned the gift. It is therefore, like gifts by will, ambulatory and conditional. The only well-defined limitations on the exercise of the right are (1) that only personal property can pass by *donatio causa mortis*, and (2) that not the whole nor substantially the whole of a man's estate can be given in this way—certainly not in one comprehensive gift to one person. But even this last limitation would not stand in the way of the giving of a coin or jewel or other single article or, probably, of several such articles, conditionally, to one person, even though such article or articles constituted the whole of the donor's estate. See GIFT.

For the rules concerning the construction and interpretation of wills, see the article on INTERPRETATION. In connection with the general subject of wills the reader may also consult the articles on EXECUTOR, LEGACY, PROBATE, and SUCCESSION. The best treatises are those of Jarman on *Wills* and Williams on *Executors.* The works of Schouler, Redfield, and Chaplin may also be consulted with advantage. Revised by GEORGE W. KIRCHWEY.

Willa'mette River: a branch of the Columbia; rises in the Cascade Mountains in Oregon, and flows first N. W. and then N. through a beautiful region, extremely fertile and now well settled. It is navigable for ships to Portland, 15 miles. Twenty-five miles from its mouth are the Willamette Falls, at Oregon City. The river here falls 40 feet perpendicularly, but a canal and locks have been constructed at a cost of over $500,000, so that small steamboats, for two-thirds of the year, can pass up to Eugene City, more than 130 miles. At Oregon City the river furnishes a noble water-power. Revised by I. C. RUSSELL.

Willard, EMMA C. (*Hart*): educator; b. in Worthington parish, Berlin, Conn., Feb. 23, 1787; educated at the village academy; began to teach school at an early age, and after her marriage to Dr. John Willard at Middlebury, Vt., opened at that place a boarding-school for girls 1814; introduced several new studies and many improvements upon the ordinary methods of instruction; wrote *A Plan for improving Female Education* (1819), which was submitted in MS. to Gov. De Witt Clinton of New York; obtained his encouragement for her project, and by a special act a portion of the State fund for academies; opened a school under his patronage at Waterford, N. Y., 1819; removed the school to Troy May, 1821; wrote several school histories and other educational books; superintended the seminary with great success until 1838, when she resigned it to her son and his wife; published her *Journal and Letters from France and Great Britain* (1833), devoting the profits (about $1,200) to the assistance of a school for women in Athens, Greece, which owed its origin to her; settled at Hartford, Conn., 1838. D. at Troy, Apr. 15, 1870. Among her numerous publications were *A History of the United States* (New York, 1828); *Universal History* (1835); *Ancient Geography*; a volume of *Poems*, containing the favorite piece, *Rocked in the Cradle of the Deep* (1830); *The Motive Powers which produce the Circulation of the Blood* (1846); *Respiration and its Effects* (1842); *Last Leaves of American History* (1849); and *Morals for the Young* (1857). See the biography by John Lord, LL. D. (New York, 1873). A statue of Mrs. Willard was unveiled in Troy, N. Y., Apr. 15, 1895. Her great prominence in the history of education in the U. S. is due especially to the fact that the cause of higher education for women found in her its most earnest and successful advocate. Revised by C. H. THURBER.

Willard, FRANCES ELIZABETH, LL. D.: reformer; b. near Rochester, N. Y., Sept. 28, 1839; graduated at the Northwestern Female College, Evanston, Ill., 1858; was a successful teacher in several Western towns; director of the Genesee Wesleyan Seminary at Lima, N. Y., 1866–67; in 1871–74 was Professor of Æsthetics in Northwestern University, and dean of the Woman's College connected with it. In 1869–71 she traveled in Europe, Egypt, and Palestine, and on her return delivered lectures in Chicago. She was the author of *Nineteen Beautiful Years*, a biographical sketch of a deceased sister (1864); *Glimpses of Fifty Years* (1889); *A Great Mother* (1894), and other works. She became president of the Woman's Christian Temperance Union in 1879; founded the World's Woman's Christian Temperance Union in 1883, and had been president of the same since 1888. She was editor-in-chief of *The Union Signal*, the official organ of the White Ribbon movement. D. in New York, Feb. 17, 1898.

Willard, SAMUEL: clergyman; son of Major Simon Willard; b. at Concord, Mass., Jan. 31, 1640; graduated at Harvard 1659; studied divinity; was minister of Groton from 1663 until driven away during King Philip's war, 1676; became colleague pastor with Rev. Thomas Thacher over the Old South church, Boston, Apr. 10, 1678; succeeded to the pastorate in the same year; opposed the witchcraft delusion of 1692; and was vice-president (exercising full powers as president) of Harvard College, as successor to President Mather, from 1701 until his death, at Boston, Sept. 12, 1707. He was twice married and had twenty children; author of *A Complete Body of Divinity*, posthumously published in a folio volume under the editorship of Joseph Sewall and Thomas Prince (Boston, 1726), and of various minor religious treatises. Revised by GEORGE P. FISHER.

Willard, Sidney: educator; son of Joseph Willard, president of Harvard College; b. at Beverly, Mass., Sept. 19, 1780; graduated at Harvard 1798; was librarian there 1800–05; studied theology, and sometimes preached, though he never held a pastoral charge; was a member of the famous Anthology Club; was Hancock Professor of Hebrew and Oriental Languages at Harvard 1807–31, filling also the chair of English Literature, and for some years that of Latin; was frequently a member of the Massachusetts Legislature, and once of the executive council, and was mayor of Cambridge 1848–50. He was the author of a *Hebrew Grammar* (Cambridge, 1817) and *Memories of Youth and Manhood* (2 vols., 1855); was one of the founders of and a contributor to the *Literary Miscellany*; also founder and editor of the *American Monthly Review* (4 vols., 1832–33); wrote largely for the *Monthly Anthology*, the *North American Review* (18 papers, 1816, *seq.*), the *General Repository*, and the *Christian Examiner*. D. at Cambridge, Dec. 6, 1856. Revised by George P. Fisher.

Willcox, Orlando Bolivar: b. at Detroit, Mich., Apr. 16, 1823; graduated at the U. S. Military Academy, and appointed second lieutenant of artillery July, 1847. On the outbreak of war in 1861 he took command of the First Michigan Volunteers, which he led at Bull Run, where he was wounded and taken prisoner, and was held until Aug., 1862, part of the time as hostage for Confederate privateers. His commission of brigadier-general of volunteers was dated from the day of his capture. At South Mountain and Antietam he commanded a division of the Ninth Corps, and at Fredericksburg was in command of that corps. During the riots arising from the enforcement of the draft in Indiana in 1863, Gen. Willcox was placed in command there. He was engaged in East Tennessee from Sept., 1863, until Mar., 1864, then transferred to the Army of the Potomac, and in the Richmond campaign of that year commanded a division of the Ninth Corps, through the Wilderness battles to Petersburg, participating in the capture of that city. He subsequently commanded various military districts until Jan., 1866, when he was mustered out. Resuming his profession at Detroit, he was also U. S. assessor of internal revenue until July, 1866, when he re-entered the army as colonel of the Twenty-ninth Infantry; transferred to the Twelfth Infantry in 1869. Brevet brigadier and major-general for gallantry at Spottsylvania and capture of Petersburg; became brigadier-general 1886; retired Apr. 16, 1887; governor of the Soldiers' Home in Washington, D. C., Feb., 1889, to June, 1892. He published *Shoepack Recollections* (Boston, 1856) and *Faca, an Army Memoir by Major March* (1857). Revised by James Mercur.

Willdenow, *vil'de-nō*, Karl Ludwig: botanist; b. in Berlin, Germany, Aug. 22, 1765; d. there, July 10, 1812; Professor of Botany in Berlin. His principal works are *Floræ Berolinensis Prodromus* (1787); *Grundriss der Kräuterkunde* (1792); the fourth edition of Linné's *Species Plantarum* (1797–1830; the last volumes completed by Link); *Caricologia* (1805); *Hortus Berolinensis* (1816; edited by Link). Charles E. Bessey.

Wil'lehad, or **Willehad**: saint; b. in Northumbria, England, early in the eighth century; was educated at York; became a priest; went as a missionary to the pagans of Friesland shortly after the martyrdom of (Saint) Boniface; was supported by Pope Adrian I. and by Charlemagne; became Bishop of "Wigmodia" (afterward Bremen) 787; built there a noble cathedral, and had great success in the conversion of both Frieslanders and Saxons. D. in Bremen, in 789. His feast is celebrated Nov. 8. He was the author of a *Commentary on the Epistles of Paul* and of several works still in MSS. See Smith's *Dictionary of Christian Biography*, and Dehio's *Geschichte des Erzbisthums Hamburg-Bremen*. Revised by J. J. Keane.

Willemite, or **Wilhelmite** [named after Wilhelm I., King of the Netherlands, by the mineralogist Levy; also called *troostite* (the New Jersey ore)]: a native silicate of zinc, of composition O_4SiZn_2; rhombohedral in crystallization; generally yellowish, greenish, or salmon-colored; generally opaque, but sometimes translucent, or even transparent; hardness somewhat below feldspar. Willemite, which is not common in Europe, occurs at some localities in New Jersey—about Franklin and Stirling—almost in rock-masses, constituting a very valuable zinc ore.

Willems, Jan Frans: philologist and author; b. at Bouchout, near Antwerp, Belgium, Mar. 11, 1793; at the age of twelve was sent to Lierre to study music and singing; gained a local reputation as an amateur actor and a composer of satirical verses; became interested in the old Flemish language and literature; in 1809 was sent to Antwerp to study in a notary's office; won in 1811 a prize offered for the best poem on the battle of Friedland; published in 1818 an ode, *Aen de Belgen* (To the Belgians), and in 1819–20 a treatise, *Over de Nederduytsche Tael en Letterkunde* (2 vols., Antwerp), his object being to induce the Government and the authors of Belgium to use Dutch as an official and literary language, claiming that it was only a modified form of early Flemish; became the leader of the Flemish movement (see Flemish Language and Literature); was alternately favored and slighted by the Dutch and Belgian Governments, according as the anti-Dutch or anti-French tendency of the Flemish movement could be used; was appointed keeper of the archives at Antwerp, but on the separation of Belgium from Holland, 1830, was removed, and in 1831 settled at Eecloo, near Ghent, where he published numerous works, including versions of *Reineke Vos* (Reynard the Fox), to which he ascribed a Flemish origin, and editions of the rhymed chronicles of Jan de Klerk and Jan van Heelu (Brussels, 1836; Ghent, 1840). In 1835 he became keeper of the archives of Ghent; in 1837 founded a quarterly review, the *Belgisch Museum*. D. at Ghent, Jan. 24, 1846. His *Life* was written by Snellaert (Ghent, 1847).

Willemstad, wil'lem-stăad: capital of the island of Curaçoa (*q. v.*), and of the Dutch West Indies; on the south side of the island, at the mouth of a channel which expands into a large lagoon; the channel and part of the lagoon form a capacious and safe harbor, admitting the largest vessels. Willemstad is a place of great commercial activity, being a central station of the European trade with the northern coast of South America. It has the appearance of a town in Holland. Pop. about 11,000. H. H. S.

Willes, Sir James Shaw, LL. D.: b. at Cork, Ireland, in 1814; educated at Trinity College, Dublin (graduated in 1836); then studied law in London with Mr. Chitty, and was called to the bar at the Inner Temple in 1840, practicing for several years before this as a special pleader; became the acknowledged leader of the junior counsel, and in 1850 was appointed a commissioner to examine and report on the subject of reform in the system of common law procedure, and he was the chief author of the acts on that subject passed in 1852, 1854, and 1860, the important services which he rendered in this matter leading to his appointment as a judge of the court of common pleas in 1855, when he was knighted; from 1851–1855 was tubman in the court of exchequer, where his chief practice was. He was a man of remarkable memory and acumen, and was perhaps the most learned judge of his time; was placed on the Indian law committee in 1861, and on the English and Irish law committee in 1862. With Sir Henry S. Keating he edited Smith's *Leading Cases* (1849). The amount of work he accomplished was enormous, and at last he gave way under the strain and committed suicide in a fit of insanity at Otterspool, Hertfordshire, Oct. 2, 1872. F. S. A.

Willet, or **Stone Curlew**: the *Symphemia semipalmata*, a bird of the snipe family found in North and South America. It is about 16 inches long, ashy above, speckled, with blackish, white, or slightly rufous or brownish below. It is a fine game-bird, and its eggs and flesh are prized as food. The name willet is derived from its note, "pilt-willwillit." F. A. L.

Willet's Point: U. S. military reservation; opposite Fort Schuyler, Throgg's Neck, at the west end of Long Island Sound, N. Y.; 2½ miles S. of Whitestone, 20 miles N. E. of the Battery, New York city (for location, see map of New York, ref. 7–B). The site, consisting of 136 acres, was bought by the Government in 1857 and 1863, for the purpose of building a fort to co-operate with Fort Schuyler in defending the eastern entrance to New York harbor. This fort was begun in 1862, but owing to radical changes in the means of attack and defense during the civil war, work upon it was suspended, and it still remains unfinished. In 1864 the Grant General Hospital was located here, and many temporary buildings were erected. At the close of the war three companies of the U. S. Engineer battalion were ordered here to establish an engineer dépôt for stores and materials, a school of practice, and a station for experiments with torpedoes. The present organization of the school was authorized by the Secretary of War in 1885, and is substantially as follows: The academic staff consists of the

commandant, the three company commanders, and the battalion adjutant and quartermaster, the adjutant as secretary of the staff, and the quartermaster as instructor in photography; the student officers consist of from ten to sixteen lieutenants of engineers who are on duty with the companies, and of an additional detail of from seven to ten lieutenants from other arms of the service for the special course in torpedoes. The engineer lieutenants usually are sent to the school directly after graduation at West Point, and remain about two and a half years. The other officers are detailed after some service with their regiments, and remain at the school ten months. The instruction, which is divided into a winter and a summer course, is intended to be practical as well as theoretical, and includes the following subjects, viz.: Submarine mining, including electricity, high explosives, and torpedo warfare; military engineering, including operations of armies in the field, seacoast defense, modern siege operations, ordnance, field fortifications, and pontoniering; civil engineering, including surveying, river and harbor improvements, hydrographic surveys, steam engineering, building superintendance, estimates, etc.; practical astronomy, including the use of instruments employed on geodetic and boundary surveys; military photography, including methods of map-reproduction, the use of the camera, development, printing, etc. The non-commissioned officers and privates, of whom there are from 350 to 400 at the post, are instructed in tactics, pontoon-drill, photography, torpedo-drill, and in several industrial trades, such as carpentry, blacksmithing, engine-driving, and, when necessary, in common-school studies.

WILLIAM R. KING, LIEUT.-COL. U. S. ENGINEERS.

Willett, MARINUS: soldier; b. at Jamaica, L. I., July 31, 1740; was a lieutenant in Delancey's regiment during the French war, and was distinguished at the unsuccessful assault upon Fort Ticonderoga; served in Col. Bradstreet's expedition against Fort Frontenac; entered McDougal's regiment as second captain early in 1775; was a captain under Montgomery in the Canada campaign of 1775–76, commanding the post of St. John until Jan., 1776, when he returned home; became lieutenant-colonel of the Third New York Regiment 1776; defended Fort Stanwix against the regulars, Tories, and Indians commanded by St. Leger Aug., 1777; made a successful sally as a diversion in favor of General Herkimer; held the fort until its relief by Arnold; joined the army in New Jersey June, 1778; was present at Monmouth; accompanied Sullivan in his campaign against the Six Nations; was sheriff of New York 1784–92; declined the post of brigadier-general in the expedition sent against the Western Indians 1792, and succeeded De Witt Clinton as mayor of New York in 1807. D. in New York, Aug. 22, 1830. He left an autobiography, from which *A Narrative of the Military Actions of Col. Marinus Willett, etc.* (New York, 1831), was prepared and edited by his son, William M. Willett.

Willey, HENRY: botanist; b. at Geneseo, N. Y., July 19, 1824; educated at the academy in that town and the Bridgewater (Mass.) Normal School; was for several years a teacher; studied law and practiced in New York State; removed to Massachusetts 1858, and after teaching for a time became editor of *The Daily Evening Standard* at New Bedford. As a botanist has occupied himself especially with lichens, his principal publications being *List of North American Lichens* (1873); *Statistics and Distribution of North American Lichens*, in *Bull.* of Buffalo Nat. Hist. Soc. (1873); *Lichens of the Yellowstone*, in *U. S. Geol. Surv. Terr.* (1873); *Lichens of Colorado* (1874); *American Lichenography*, in *Proc.* Essex Inst. (1867); *An Introduction to the Study of Lichens* (1887); *Synopsis of the Genus Arthonia* (1890); *Enumeration of the Lichens found in New Bedford, Mass.* (1892). He also edited part ii. of Tuckerman's *Synopsis of the North American Lichens* (1888). CHARLES E. BESSEY.

William: the name of four kings of England. (1) WILLIAM I., THE CONQUEROR, King of England (1066–87); b. at Falaise, Normandy, in 1027 or 1028, the bastard son of Robert the Devil, Duke of Normandy, by the beautiful Arletta, a tanner's daughter of Falaise; was educated at the court of King Henry I. of France; succeeded by his aid to the ducal throne of Normandy on the death of his father in 1035, and married, in 1053, Matilda, a daughter of Count Baldwin V. of Flanders. In his many feuds with his vassals and neighbors, and with the King of France, he showed himself a man of superior talents, and his ambition was fully on a par with his power. As the English king, Edward the Confessor, had no children, William laid claim to the succession, his grandmother, Emma, being a sister to Edward. It is said that the king himself acknowledged the claim, and William maintained that Harold had pledged himself on a visit to Normandy in 1064 that he would not oppose his succession. Nevertheless, when Edward died (Jan. 5, 1066), Harold was elected king by the Anglo-Saxon nobles, and rejected William's demand that he should fulfill his promise. The Norman duke thereupon formed an alliance with Tostig, Harold's banished brother, composed his affairs at home, and having secured from Pope Alexander II. a declaration that his claim was just, and a blessing on the expedition, gathered a large force in the harbor of St.-Valéry, at the mouth of the Somme, crossed the Channel, and landed at Pevensey Sept. 29. On Oct. 14 was fought the battle of Hastings or Senlac between him and Harold; the Anglo-Saxons were completely routed, Harold fell, and, Dec. 25, William was crowned King of England at Westminster. His government was at first conciliatory, but as one insurrection followed another, and found support both from the Scots and the Danes, he adopted severe measures, subjecting the conquered to heavy fines and confiscations. With the capture of Ely (1071), where Hereward had kept up an obstinate resistance to the invaders, the conquest of England was complete, and in 1072 William forced the Scottish king, Malcolm III., to do him homage. The whole country between the Tees and the Humber was laid waste, and every Saxon was expelled from his position in the administration, the courts, and the Church, and supplanted by a Norman. The estates of the fallen or banished Saxon nobles were partitioned out to the Norman lords; but, in order to prevent the concentration of too much power in the hands of a vassal, care was taken that the lands thus bestowed should not be contiguous. A network of military stations was spread over the whole country—strongly fortified castles, from which the feudal Norman kept the Saxon population in absolute submission. In 1068 the curfew-bell was introduced, at the sound of which every light and fire in the country should be extinguished, and between 1080 and 1086 a survey was taken of the Conquest and the division of the spoil—the so-called DOMESDAY BOOK (*q. v.*). The landholders were obliged to swear fealty to the king, who, while retaining the forms of feudalism, exalted the royal authority and laid the foundation of a strong kingship, in marked contrast to the feebleness and uncertainty that characterized the feudal monarchies of the Continent. In the political system that he established, the upper ranks and great positions were filled by the Normans, while the native population made up the lower orders in the feudal scale. Though a harsh ruler he administered a rude kind of justice, repressing the tyranny and violence of his nobles as a menace to his own authority. As the Anglo-Saxon Chronicle says, "He would permit no plunder save his own." Besides the establishment and consolidation of his power in England, William carried on a series of wars on the Continent with his son, with Brittany, with the King of France, etc. In a campaign against France he was injured by a fall from his horse at Mantes-sur-Seine. He was brought to Rouen, and died there Sept. 9, 1087. He was buried in the Church of St. Stephen at Caen. (See Thierry, *Histoire de la Conquête de l'Angleterre par les Normands* (1825); Freeman, *History of the Norman Conquest of England* (1867); Palgrave, *England and Normandy* (1851–64); and Stubbs, *Constitutional History of England* (1874).) —(2) WILLIAM II., RUFUS, King of England (1087–1100), b. in Normandy in 1056, son of William the Conqueror; was educated in England by Lanfranc, and succeeded to the throne of England on the death of his father, while his elder brother, Robert, took possession of Normandy. He was soon (1088) involved in war with the partisans of his brother in England, who stirred up a serious rebellion, which, however, he soon put down with the aid of his English subjects. Two years later he carried the war into Normandy, and forced his brother to consent to humiliating terms of peace. He also waged war with Scotland, invaded Normandy a second time in 1094, quarreled with the King of France, and attempted to conquer the Welsh. He came finally into possession of Normandy when, in 1096, Robert mortgaged the country to him on setting out for the Holy Land. He was planning to secure Aquitaine, but before he could take possession of this new dominion he was shot by Walter Tyrrel, or Tirel, while hunting in the New Forest, Aug. 2, 1100. He built London Bridge and completed London Tower and Westminster Hall. (See Freeman, *Reign of*

William Rufus.)—(3) WILLIAM III., King of Great Britain and Ireland (1689–1702) and stadtholder of the Netherlands (1672–1702), a son of William II., Prince of Orange and stadtholder of the Netherlands, and Mary, the eldest daughter of Charles I., King of England, b. at The Hague, Nov. 4, 1650, ten days after the death of his father. His mother died in 1661; Louis XIV. took possession of the family estate of Orange; Oliver Cromwell persecuted him as a Stuart; and in the Netherlands, where his father had exerted himself to make the stadtholdership hereditary in the family of Orange, Jan de Witt carried through a law which prevented any person from being at the same time stadtholder and commander-in-chief of the military forces of the republic. Nevertheless, in 1672, when France and England attacked the Netherlands, and Jan de Witt had been murdered, William was made stadtholder and commander-in-chief, and by his military and diplomatic talents he freed the country from the grasp of Louis XIV. much in the same way as his ancestor had wrenched it from the grip of Philip II. He succeeded in detaching England from France, and the Peace of Nymwegen (1678) was at least honorable to the republic. In 1677 he married his cousin Mary, eldest daughter of James, Duke of York, and heir-presumptive to the English crown, and in the contest between the king and the people, which became almost desperate, as soon as James ascended the throne, he naturally became the center of the opposition. In 1688 he was invited by a large number of the most prominent men in England to interfere, and on Nov. 5 of the same year he landed at Torbay with an army of 15,000 men. James fled to France, deserted by all, and on Feb. 13, 1689, was deposed by Parliament, and William and Mary were established on the throne. James afterward went to Ireland, where the Roman Catholic population rose in favor of him, but he was completely defeated in the battle of the Boyne, and in Ireland, as well as in Scotland, all Jacobite movements were successfully suppressed. In Dec., 1689, England joined the Grand Alliance against France, which William had formed between Austria, Spain, and the Netherlands. From 1691 William himself commanded the allied army in the Netherlands, and although he was defeated at Steenkerke (Aug. 4, 1692) and at Neerwinden (July 19, 1693), he nevertheless prevented France from making any progress. At La Hogue the French fleet was nearly annihilated in 1692, and by the Peace of Ryswick (1697) England and the Netherlands lost nothing and France was utterly exhausted. Louis XIV., however, had by no means given up his ambitious plans, and England had just determined and publicly announced that it would take part in the Spanish war of succession when William died Mar. 8, 1702, in consequence of a violent fall from his horse. In England he was not loved, and his position was often very difficult, especially after the death of Mary (Dec. 28, 1694). He was entirely destitute of all those small arts by which a man in a superior position so easily wins the confidence, good will, and enthusiasm of his inferiors; but the soundness and elevation of his political views, and the sagacity and self-sacrificing energy with which he carried them out, have probably never been doubted. His great task was to resist Louis XIV., and in him political absolutism and religious intolerance; and he fulfilled it. (See Trevor, *Life and Times of William III.* (1835); Vernon, *Court and Times of William III.* (1841); Macaulay's *History of England*; and H. D. Traill, *William III.* in Twelve English Statesmen Series (1888).)—(4) WILLIAM IV., King of Great Britain, Ireland, and Hanover (1830–37), b. in London, Aug. 21, 1765, the third son of George III.; was educated for the navy; became a lieutenant in 1785, an admiral in 1801, and lord high admiral in 1827; was created Duke of Clarence in 1789, became heir-presumptive to the crown in 1827, and succeeded to the throne June 26, 1830. The chief event of his brief reign was the movement for parliamentary reform, which was secured by the Reform Act of 1832. Though he had professed to be a Whig and in favor of liberal measures, his blundering and irresolute conduct obstructed the much-needed reform, and by prolonging the crisis exasperated the people. D. at Windsor, June 20, 1837. He had entered in 1790 into a connection with an actress, Dora Jordan, by whom he had ten children, but he left her in 1811 for political reasons, and in 1818 he married a German princess. He was succeeded in Hanover by his brother, and in England by his niece, Victoria. For a further account of the events of his reign, see the articles on his ministers. GREY, CHARLES; MELBOURNE, WILLIAM LAMB; and PEEL, ROBERT. F. M. COLBY.

William: the name of three kings of the Netherlands, descending from the brother of William the Silent of Orange-Nassau.—WILLIAM I. (1815–40), was born at The Hague, Aug. 24, 1772, the eldest son of William V., Prince of Orange-Nassau and stadtholder of the Dutch republic, and married, Oct. 1, 1791, Friederike Luise Wilhelmine, a daughter of Frederick William II. of Prussia. When the National Convention of France declared war against the republic (Feb. 1, 1793), William assumed the command of the Dutch army, but on Jan. 18, 1795, he embarked with his father and the rest of the family at Scheveningen, and went to England. Aug. 29, 1802, he received the principality of Fulda, together with Corvey, Dortmund, and Weingarten, which had been given to his father in compensation for the Netherlands, and he now resided for several years at Fulda. On his father's death (Apr. 9, 1806), he came into possession of the hereditary estates of the family, Nassau-Dietz, but having allied himself with Prussia and accepted a command in the Prussian army, he was taken prisoner at Jena by the French, and all his possessions were confiscated by Napoleon. He was soon released from his captivity, and fought against the French at Wagram, but lived subsequently in retirement at Berlin until after the battle of Leipzig. The Hollanders now rose against the French, and on Nov. 29, 1813, William landed at Scheveningen, and was hailed by the people as their sovereign. By the Congress of Vienna the kingdom of the Netherlands, consisting of Holland and Belgium, was formed, and on Mar. 16, 1815, William I. was proclaimed king. In compensation for his hereditary possessions, which were given partly to Prussia, partly to Nassau, he received the grand duchy of Luxemburg. The combination of Holland and Belgium proved a blunder. By the revolution of 1830, Belgium seceded, and was recognized as an independent kingdom by the powers at the conference in London Dec. 20, 1830. William I., however, would not submit to this decision, but continued his protest and resistance up to 1839 in a very foolish manner. This and other circumstances made him unpopular, and on Oct. 7, 1840, he found it advisable to abdicate in favor of his son. He went to Berlin with an enormous fortune, and died there Dec. 12, 1843.—WILLIAM II. (1840–49), b. at The Hague, Dec. 6, 1792, the eldest son of William I., was educated in the military academy of Berlin and the University of Oxford; served in the Spanish and British armies against the French, and distinguished himself at Quatre-Bras and Waterloo, where he was wounded. On Feb. 21, 1816, he married the Grand Duchess Anna Paulovna, a sister of Alexander I. of Russia. As king, he restored order to the finances, which had fallen into utter confusion during the reign of his father, but showed himself very unwilling to enter on any political reforms. Nevertheless when, in 1848, the fermentation became dangerous in the country, he consented to a thorough reorganization of the government, but died before the new constitution could be established Mar. 17, 1849.—WILLIAM III., b. at The Hague, Feb. 19, 1817, the eldest son of William II.; married June 18, 1839, Sophie, a daughter of King William of Würtemberg, and succeeded to the throne Mar. 17, 1849. When the German union was dissolved in 1866, he succeeded in separating Limburg and Luxemburg from all connection with Germany, and annexed the former completely to the Netherlands. Concerning the latter, negotiations were opened by Napoleon III., who wanted to buy it, but these negotiations were frustrated by Bismarck, and Luxemburg was declared neutral under the sovereignty of the house of Orange-Nassau by the treaty of May 11, 1867. Though notoriously licentious in his private life, he was a politic and progressive ruler, and in internal affairs his government was very successful. In 1879 he married the Princess Emma of Waldeck-Pyrmont, by whom he had two daughters, the elder of whom, the Princess Wilhelmina, became the heir to the throne. D. at the Castle of Loo, Nov. 23, 1890.

William I., Emperor of Germany and King of Prussia: b. in Berlin, Mar. 22, 1797; the second son of King Frederick William III. and Queen Luise, a Princess of Mecklenburg. He grew up with the humiliating impressions of the defeat of Jena, but distinguished himself in the campaigns of 1813–14 against France. All his life through he was an enthusiastic soldier, indefatigable in the military service, even in its minutest details. When his father died (1840), and his elder brother, Frederick William IV., became king, he received the title of Prince of Prussia as heir-presumptive,

but for many years was not prominent in political affairs. He was considered an absolutist, and for this reason, as well as on account of his military inclinations, he was very unpopular. On the outbreak of the revolution in 1848 he was compelled to leave the country and go to England. On his return in the same year he entered the Prussian national assembly as member for Wirsitz and delivered a speech in which he declared himself in favor of constitutional government. In the spring of 1849 he took command of the military force sent against the South German insurgents, and quickly suppressed the revolution in the Palatinate and Baden. Later, when the supremacy of the Austrian policy in German affairs was felt with much regret in Prussia, public opinion underwent a change concerning the prince, and people began to look at the strength and firmness of his character as a support of the greatness of Prussia. He was nevertheless by no means popular, and frequent collisions arose between him and the people when he came to the head of the Government as regent Oct. 9, 1858, and as king Jan. 2, 1861. It was the reorganization of the army which aroused the bitterest opposition. The king considered this measure as the most effective means of elevating the Prussian state, while the people looked at it as an instrument of oppression. There followed what is known as the "Conflict Time," in which neither the king nor his opponents in the Prussian chamber would give way, and the former, in order to carry out the scheme of military reform, was obliged to rely on the upper house for supplies in direct opposition to the spirit of the constitution; but the resolution and energy of Bismarck won in the end, and the reorganization was effected. In the war with Denmark (1864) the army proved able and effective, and the king began to be popular. This change was more apparent in 1866, when, under the personal leadership of the king, brilliant victories were won over Austria and her German allies. The Landtag readily granted an indemnity for all military expenditures. By the *publicandum* issued from Ems July 26, 1867, William placed himself at the head of the newly formed North German union, and assumed for himself and his successors to the Prussian crown the rights and duties connected with this new dignity. But the greatest glory was gained by the king in the war with France (1870–71). The refusal of Napoleon III.'s demand for territory on the Rhine and the thwarting of his designs on Belgium and Luxemburg had made war probable, and all measures were taken to insure success when the conflict came. The war was desired by the king and Bismarck as the means of strengthening Prussia and attaining German unity. Napoleon's folly in the matter of Prince Leopold of Hohenzollern's candidacy for the Spanish throne offered a welcome opportunity of refusing his demands and making him appear as an aggressor in the war that followed. In the negotiations with the French ambassador, Benedetti, in Ems July, 1870, the king's presence of mind, courage, and dignity won general admiration, and the enthusiasm for him increased every day as the German army pushed farther into France and gained one victory after another. Moved partly by the brilliancy of the victory, partly by the personality of the victor, the German princes, so long divided, finally agreed in offering the imperial crown of Germany to King William, and he accepted it at Versailles Jan. 18, 1871. On Mar. 15, 1871, he returned to Berlin. Here a new contest awaited him. The internal state of Germany, especially on the ecclesiastical field, needed a development in a liberal direction, and the policy of Bismarck soon brought about a conflict with the Roman Curia. (See KULTURKAMPF and FALK LAWS.) The next difficulty to be dealt with was the socialist agitation, which had increased to an alarming extent. In 1878 occurred Hödel's attempt on the emperor's life, and this was soon followed by the murderous assault of Dr. Nobiling, who succeeded in wounding his victim. Influenced by these events the Reichstag passed Bismarck's anti-socialist law, which expired in 1881, but which has been several times renewed. Despite this repressive policy the Social-Democratic party increased in strength, and the emperor and Bismarck competed for the favor of the laboring man by a plan of social reform based on the principles of state socialism. An illustration of this paternal policy is Bismarck's law for the insurance of workingmen against accidents. In his foreign policy the emperor showed himself determined to keep what had been gained from France, but to avoid war if possible. To insure peace he endeavored to make Germany so strong that none dare attack her. To guard against a combined attack from Russia and France he formed a military alliance with Austria-Hungary and Italy, the *Dreibund*. D. in Berlin, Mar. 9, 1888.

Revised by F. M. COLBY.

William II.: German emperor and King of Prussia; b. Jan. 27, 1859, eldest son of Frederick, second German emperor and eighth King of Prussia, who was eldest son of William I. He received a thorough military training and instruction in administrative methods. On the death of his father, June 15, 1888, he became emperor and early showed himself a resolute upholder of the traditional rights and dignity of his office. His speeches inspired the fear that his policy would be reactionary, his tone being that of a monarch convinced of his divine right. He was soon at variance with Bismarck, who, finding himself unable to retain his influence, resigned in 1890. Some of the important features of the reign are the strengthening and renewal of the Triple Alliance, the legislation in favor of the workingman, and the cession to Germany of Heligoland. William II. married Feb. 27, 1881, Princess Victoria of Schleswig-Holstein-Augustenburg.

William, THE SILENT: See WILLIAM OF NASSAU.

William and Mary, College of: an institution of learning near Williamsburg, Va.; in its antecedents the oldest in the U. S., dating back to 1617, and in its actual operation standing next to Harvard College, having been founded in 1693. A grant of land for the establishment of an Indian college and an English seminary of learning at Henrico was made by the Virginia Company in 1619, and £1,500 was raised by the bishops of England for the encouragement of Indian education. A collegiate school was opened at Charles City in 1621, but was suspended by reason of the Indian massacre of 1622, and a second project, to found a university to be called Academia Virginiensis et Oxoniensis, on an island near the mouth of the Susquehanna, failed on account of the death of its chief advocate, Edward Palmer. In 1660 the colonial assembly of Virginia voted to purchase land for a college and free school. Subscriptions of money were received from Gov. Berkeley and others in the colony as well as in England, and in 1691 the assembly sent Rev. James Blair, D. D., to secure a charter from the English crown. King William and Queen Mary approved. The charter was signed in Feb., 1693, and the Government appropriated, toward the support of the college, lands, funds, a duty on exported tobacco, and all fees and profits arising from the office of surveyor-general. Dr. Blair became the first president. Six masters or professors, who were graduates of Oxford and Cambridge, were appointed. Several scholarships were founded, a school for Indians was established about 1697, and at Dr. Blair's death (1743) the college was highly prosperous. It was the wealthiest college in America when the war of the Revolution broke out, but the war deprived it of all endowments, save 20,000 acres of land, by the sales of which a new moneyed endowment of about $200,000 was obtained. In 1781 the buildings were occupied alternately by the British and the French and American troops, and while used as hospitals by the latter were injured by fire. The college exercises, however, were interrupted for a few months only. During the civil war the college was closed, the buildings and grounds were occupied by U. S. forces, and several buildings, together with the library and apparatus, were destroyed. In 1869 the main building was restored, and the college was reopened; but in 1882 financial embarrassment made it necessary to close its doors. In 1888 the general assembly of Virginia appropriated $10,000 a year, subsequently increased to $15,000 to establish in connection with collegiate training "a system of normal instruction and training." The college was reopened in Oct., 1888, with a full faculty, and has since enjoyed fair success. In 1893, by an act of Congress, it received $64,000 indemnifying it for losses sustained during the civil war.

The present faculty consists of a president, Lyon G. Tyler, and fifteen professors and tutors. It confers the degrees of master of arts, bachelor of arts, bachelor of letters, and licentiate of instruction. There are seven departments. As an adjunct to the department of pedagogy a well-equipped model school is carried on in Williamsburg. The library contains about 8,000 volumes. The number of students in 1900 was 192. The institution is undenominational. Among its distinguished alumni have been Thomas Jefferson, James Monroe, and John Tyler, Presidents of the U. S.; Benjamin Harrison, Carter Braxton, Thomas Nelson, and George Wythe, who, with Jefferson, were signers of the

Declaration of Independence; Edmund Randolph, chief draughtsman and author of the Constitution; John Marshall and Bushrod Washington, jurists; and Lieut.-Gen. Winfield Scott. The Phi Beta Kappa Society, established to promote literature and patriotism among the youths of the colony, was founded at William and Mary in 1776. Until 1776 the chancellors of the college were, with several exceptions, the bishops of London. George Washington was chancellor 1788–99. See *The History of the College of William and Mary* (Baltimore and Richmond, 1874) and *Circular of Information, Bureau of Education*, No. 1 (Washington, 1887).

William Jewell College: See the Appendix.

William of Champeaux: anglicized form of GUILLAUME DE CHAMPEAUX (*q. v.*).

William of Malmesbury: See MALMESBURY.

William of Nassau, sometimes called **William of Orange**, or **William the Silent**: b. at Dillenburg, Nassau, Apr. 14, 1533; was the eldest son of Count William of Nassau-Dillenburg and his second wife, Juliana von Stolberg, both of whom were Protestants. In 1544 he inherited from his cousin, Renatus of Nassau, the principality of Orange in Provence, whence he derived the title of Prince of Orange, and extensive estates in the Low Countries, and he was now sent to Brussels, where he was educated at the court in the Roman Catholic faith. When he was fifteen years old he became a page to Charles V., who employed him, while still a young man of twenty years, in the highest military and diplomatic positions, and on his abdication (1555) recommended him in the strongest terms to his son and successor. In the beginning, Philip II. also seemed inclined, if not to put confidence in him, at least to use him. He held high offices in the provinces; he negotiated the preliminary arrangements for the Peace of Cateau-Cambrésis in 1559; and he was one of the four hostages—the Duke of Alva was another—whom Spain sent to France as a guaranty for the fulfillment of the treaty. While there the French king, Henry II., one day told him that there existed a secret treaty between him and Philip II. for the purpose of destroying all Protestants within their dominions; but, although this communication must have shocked and angered him, such was his self-possession and presence of mind that the news was received as carelessly as it was given. His discretion on this occasion earned for him the sobriquet of "The Silent," which, however, in nowise applies to his general character, for in his usual bearing he was frank and cordial. As a young man he kept a magnificent household, and exercised a most generous hospitality. Soon, however, after his conversation with Henry II., he found other use for his money, for he rose immediately in opposition to Philip II., and never, as long as he lived, gave up his resistance for one moment. As governor of Holland and Zealand he refused in 1564 to allow the establishment of the Spanish Inquisition in these provinces; and although he had not signed the compromise which the *Gueux* or Beggars presented to the regent, Margaret of Parma, in 1566, yet he supported their demands at the court. When, finally, Philip II. decided to send the Duke of Alva as governor-general to the Netherlands with a large Spanish army, William resigned all his offices and retired with his family to Germany. As soon as Alva arrived, the most arbitrary measures for the religious and political suppression of the provinces were carried out, often with incredible atrocity. William was summoned to appear before the council which had condemned Egmont and Horn, and his eldest son, a boy of thirteen years, who studied at the University of Louvain, was seized and carried to Spain, where he was held in captivity for twenty-eight years. In 1568 he raised an army by his own funds, and afterward invaded the country, but although he gained some advantages, he was unable either to rouse the population to a general revolt or to bring Alva to a decisive battle; and he was soon compelled by lack of money to disband his army. In 1572 he made a new attempt, and with greater effect. In 1570 he had issued letters of marque to privateers, and these "Beggars of the Sea" inflicted great damages on Spanish commerce, especially since they early in 1572 had come into possession of Briel and Flushing, which formed a solid basis for their operations and commanded the navigation of the Scheld and the Meuse. Thus war with Spain appeared to be a remunerative trade, while obedience had proved to be utter desolation and ruin, and, consequently, on the approach of William with a new army, the province of Holland rose in open rebellion, and its states chose William, stadtholder in July, 1572. Gelders, Overyssel, Zealand, and Utrecht immediately joined, and although William, failing to obtain aid from the French, was again compelled to disband his army, war nevertheless now began to be carried on in a regular manner against the Spaniards. The military successes which the Hollanders achieved under the leadership of William were not very remarkable, but the heroism of the people was displayed on many occasions, as in the defense of Leyden. It soon became apparent that the provinces under Spanish rule were impoverished, while the provinces under William's administration prospered. By degrees the hatred to the Spaniards spread throughout the southern provinces, even among the Roman Catholics, and in Oct., 1576, William brought about the so-called "Pacification of Ghent," by which all the provinces united for the purpose of driving the foreign soldiers out of the country and establishing religious toleration. The southern provinces, however, soon separated from the league, and returned under the Spanish rule. In Jan. 23, 1579, was signed the "Union of Utrecht," by which Philip II. was formally deposed. On Mar. 15, 1580, Philip II. put a price of 25,000 crowns on William's head, and after several attempts which failed, one Balthazar Gérard finally succeeded in shooting him, at Delft, July 10, 1584. He had been four times married, and left twelve children, of whom the two sons, Maurice and Frederick Henry, became very celebrated. See Motley, *The Rise of the Dutch Republic* (1856); Klose, *Wilhelm I. von Oranien* (1864); Herrmann, *Wilhelm von Oranien* (1873); Juste, *Guillaume le Taciturne* (1874); Barrett, *William the Silent* (1883); and Kallig's *Wilhelm von Oranien* (1885). Revised by F. M. COLBY.

William of Orange: See WILLIAM III. of England.

William of Tyre: historian; b. in Syria, about 1137; educated at Antioch and Jerusalem; visited France and Italy; was made Archbishop of Tyre in 1175; was one of the six bishops who represented the Latin church at the Lateran council (1179); wrote *Historia de Orientalibus Principibus*, and a history of the crusades between 1127 and 1184. It is entitled *Historia Rerum in Partibus Transmarinis Gestarum*, and is one of the finest specimens of mediæval historiography, full, accurate, and impartial. It was first printed by Bongarsius (Basel, 1549), afterward by Migne. There are German and French translations.

William of Wykeham: Bishop of Winchester and chancellor of England; b. at Wykeham or Wickham, Hampshire, England, in 1324, of poor parents; was educated at Winchester School; became private secretary to his patron, Sir John Scures, by whom he was recommended to the notice of Edward III., who received him into his service as clerk of the royal works then being carried on at Henley and at Yethampstead May, 1356; became "chief keeper and surveyor of the castles of the king at Windsor, Leeds, Dover, and Hadlee" Oct. 30, 1356; was virtually the architect of Windsor Castle, which was built under his eye, as also of Queensborough Castle in the Isle of Sheppey; took holy orders; became rector of Pulham, Norfolk, 1357, prebendary of Lichfield 1359, of London and Southwell 1361, of Lincoln 1362, of York Mar., 1363, and Archdeacon of Northampton and of Lincoln the same year; was appointed keeper of the privy seal 1364, Secretary of State 1366; Bishop of Winchester 1367; was Lord Chancellor 1367–71; founded St. Mary's College at Winchester and New College, Oxford, 1373; was deprived of the temporalities of his see and excluded from Parliament 1376, but restored on the accession of Richard II. (1379); completed his munificent foundation at Oxford 1386; was again chancellor 1389–91, and rebuilt Winchester Cathedral 1395–1405. D. at South Waltham, Sept. 24, 1404. A splendid monument was erected to his memory in Winchester Cathedral. See *Three Chancellors—Lives of Wykeham, Wynflete, and Sir Thomas More* (1860), by an anonymous writer, and *Life*, by G. H. Moberly (1887). Revised by S. M. JACKSON.

Williams, ALPHEUS STARKEY: soldier; b. at Saybrook, Conn., Sept. 20, 1810; graduated at Yale College 1831, but continued his studies in the law school there two years longer; in 1836 removed to Michigan, and took up his residence in Detroit, where he began to practice law; was chosen alderman of that city in 1843, city recorder in 1844, and from 1840 to 1844 was judge of probate of Wayne County. In 1843 he became proprietor of the Detroit *Daily Advertiser*, of which he was also editor until 1848. In the war with Mexico he served as lieutenant-colonel of the First Michigan Volunteers, and was postmaster of Detroit from

1894 to 1853. On the outbreak of civil war he was (May 17, 1861) appointed a brigadier-general of volunteers, and afterward commanded a division in the Shenandoah; succeeded to the temporary command of the Twelfth Corps in 1862, which he led at South Mountain, at Antietam (after the fall of Gen. Mansfield), and until Apr., 1863; in temporary command of corps at Gettysburg; transferred with his corps to Tennessee in October, and engaged at Lookout Mountain. In Sherman's Atlanta campaign of 1864 he commanded a division of the Twentieth Corps, succeeding to the command of that corps Nov. 11, which he held during the march to the sea and the campaign in the Carolinas. He was mustered out of service in Jan., 1866; was U. S. minister to Salvador 1866–69; and member of Congress 1875–78. D. in Washington, D. C., Dec. 21, 1878. Revised by JAMES MERCUR.

Williams, EDWARD: poet and Celtic scholar; better known by his bardic name of IOLO MORGANWG; b. in the parish of Llancarvan, Glamorganshire, Wales, in 1745; was associated with Owen Jones and William Owen Pughe in the editorship of the great collection of ancient Welsh literature known as the *Myvyrian Archaiology* (3 vols., 1801–07); published *The Fair Pilgrim, a Poem translated from the Welsh* (1792), and *Poems, Lyrical and Pastoral* (2 vols., 1794, in the former of which appeared *An Ode on the Mythology of the Ancient British Bards, in the manner of Taliesin*, accompanied by notes and specimens of "Triads" containing the metaphysical and religious doctrines of the old Druidical bards, alleged to have been copied from the MS. of a Welsh poet of the sixteenth century. This publication gave rise to a controversy as to the genuineness of these "Triads," and the alleged MS. was never produced. Williams was a friend of Southey, and was recognized as the best Welsh writer of his time. D. at Flemingstone, Wales, Dec. 17, 1826. His posthumous Welsh work, *Secrets of the Bards of the Isle of Britain* (1829), was edited by his son, Taliesin Williams. An amusing volume, *Recollections and Anecdotes of Edward Williams* (1850), was published by Elijah Waring.

Williams, ELEAZAR: missionary; b. at Caughnawaga, N. Y., about 1787; son of Thomas Williams by an Indian woman, and supposed to have been a descendant of Rev. John Williams, of Deerfield, Mass., known as "the redeemed captive." He was educated at Longmeadow, Mass.; served in the American army in the war of 1812–15, being wounded at Plattsburg; became a missionary of the Protestant Episcopal Church among the Oneida and St. Regis Indians, and subsequently among the tribes at Green Bay, Wis. About 1842 the claim was made that he was the dauphin of France, son of Louis XVI. and Marie Antoinette, and a narrative of his having been rescued from prison at Paris and brought to the U. S. gradually gathered form, and was embellished with all necessary details, including the total loss of memory by the young prince in consequence of his sufferings in prison. The story was brought out by Rev. J. H. Hanson in a famous article in *Putnam's Magazine—Have we a Bourbon among us?*—in 1853, expanded the following year into a volume entitled *The Lost Prince*. Belief in this story was much aided by a remarkable personal resemblance to the Bourbon type. Williams died at Hogansburg, N. Y., Aug. 28, 1858. He was the author of an *Iroquois Spelling-Book* (1813); a translation of the *Book of Common Prayer* into Iroquois (1853); a political tract against the British (1815); and a *Life of Thomas Williams* (1859).

Revised by F. M. COLBY.

Williams, EPHRAIM: soldier; b. at Newton, Mass., Feb. 24, 1715; served in Canada against the French in the war of 1740–48, attaining the rank of captain; received from the Massachusetts Legislature a grant of 200 acres of land in the present townships of Adams and Williamstown, upon which he erected Fort Massachusetts 1751, and was made commander of the whole line of frontier posts W. of the Connecticut river, and on the renewal of war with the French in 1755 led a regiment of Massachusetts troops to join Sir William Johnson in his projected invasion of Canada; made his will while on the march, leaving his property to found a free school at Williamstown (see WILLIAMS COLLEGE); fell in an ambuscade of French and Indians near the head of Lake George, N. Y., and was killed Sept. 8, 1755. On the spot where he fell a monument was erected in 1854 by the alumni of Williams College.

Williams, Sir GEORGE: See the Appendix.

Williams, GEORGE HENRY: jurist; b. at New Lebanon, N. Y., Mar. 23, 1823; educated at an academy in Onondaga County; was admitted to the bar 1844; settled in Iowa; judge of the first judicial district 1847–52, and a presidential elector in 1852; was chief justice of Oregon Territory 1853–57; member of the Oregon constitutional convention 1857; U. S. Senator 1865–71; member of the commission which signed the Treaty of Washington for settling the "Alabama claims" 1871; and was Attorney-General in President Grant's cabinet 1872–75. He was nominated chief justice of the U. S. Supreme Court 1873, but not confirmed by the Senate, and practiced law in Washington after resigning his seat in the cabinet.

Williams, GEORGE HUNTINGTON: geologist; b. in Utica, N. Y., Jan. 28, 1856. He graduated at Amherst College in 1878, and then studied in Germany, making a specialty of petrography, and obtained the degree of Ph. D. at Heidelberg in 1882. On his return to the U. S. he was called to the Johns Hopkins University, where he was advanced, until in 1892 he became Professor of Inorganic Geology. He studied the geology of Maryland with success, and prepared numerous memoirs on that subject, also in his own specialty of petrography, contributing bulletins to the U. S. Geological Survey. To him is due an electric machine for cutting and grinding thin sections of rocks and the petrographic microscope. He was a member of foreign and American scientific societies, vice-president of the Geological Society of America, and a member of the international jury of awards at the Columbian Exposition in Chicago, 1893. Besides some seventy-five papers contributed to the literature of his specialty, as well as much cyclopædia work, including charge of departments for *The Universal Cyclopædia* and *The Standard Dictionary*, he was the author of an excellent work on the *Elements of Crystallography* (New York, 1890). D. at Utica, N. Y., July 12, 1894. MARCUS BENJAMIN.

Williams, HENRY SHALER, Ph. D.: paleontologist and geologist; b. at Ithaca, N. Y., Mar. 6, 1847; graduated at the Sheffield Scientific School, Yale University, 1868; after teaching at Yale and at the Kentucky University became Professor of Geology and Paleontology at Cornell University 1879; resigned his position in 1892 to accept the chair of Geology at Yale, where he succeeded James D. Dana; became chairman of the section of geology and geography of the American Association for the Advancement of Science, 1892; secretary of the International Congress of Geologists at Washington 1891. His most extensive studies have pertained to the Devonian and Carboniferous systems, and he has made important contributions to their stratigraphy and paleontology. Among his publications are *The Classification of the Upper Devonian* (*Proc.* Am. Assoc. Adv. Sci., 1885); *Fossil Faunas of the Upper Devonian* (*Bull.* 3, U. S. Geol. Survey, 1884, also *Bull.* 41, 1887); *The Cuboides Zone and its Fauna* (*Bull.* Geol. Soc. America, 1890); *Correlation Papers, Devonian and Carboniferous* (*Bull.* 80, U. S. Geol. Survey, 1891). G. K. G.

Williams, ISAAC: clergyman and author; b. at Cwmcynfelin, near Aberystwith, Wales, Dec. 12, 1802; studied at Trinity College, Oxford; graduated 1826; took orders in the Church of England 1829; became a fellow of Trinity 1831; was curate successively of Windrush, St. Mary the Virgin's, Oxford, and Bisley; was associated with Keble, Newman, and Pusey in the "Tractarian" movement, having written the tracts Nos. 80, 86, and 87, and was a successful imitator of Keble as a sacred poet; was defeated by Garbett in his candidacy for the professorship of poetry at Oxford 1842; was a contributor to the *Lyra Apostolica*; wrote numerous theological treatises imbued with a vein of mysticism and symbolism, and spent his later years in complete retirement at Stinchcombe, Gloucestershire, where he died May 1, 1865. He was the author of *The Cathedral, or the Catholic and Apostolic Church of England, in verse* (London, 1838); *Hymns* (1839); *Thoughts in Past Years* (1842); *Harmony and Commentary on the Whole Gospel Narrative* (8 vols., 1842–45); *The Baptistery* (4 parts, 1842–44); *The Christian Scholar* (1849); *The Altar* (1849); *The Seven Days, or the Old and the New Creation* (1850); *The Apocalypse* (1852); *The Beginning of the Book of Genesis* (1861); *The Psalms interpreted of Christ* (3 vols., 1864–65); and other works. See his *Autobiography* (1892).

Revised by S. M. JACKSON.

Williams, JAMES DOUGLAS: Governor of Indiana; b. in Pickaway co., O., Jan. 16, 1808; settled in Knox co., Ind., in childhood; received a common-school education; became a farmer and stock-raiser; was frequently elected as a Democrat to the lower house of the Legislature; was State

Senator 1859–67 and 1871–75; chosen member of Congress 1874, serving as chairman of the committee on accounts; was a member of State board of agriculture seventeen years, and its president four years, and was chosen Governor of Indiana over Gen. Benjamin Harrison at election of Oct., 1876, after one of the most exciting contests in the political history of the U. S. He was widely known by the sobriquet of "Blue Jeans," given him by his supporters on account of the farmer's costume which he ordinarily wore. D. in Indianapolis, Nov. 20, 1880.

Williams, John, D. D.: archbishop; b. at Aber-Conway, Carnarvonshire, Wales, Mar. 25, 1582; educated at Ruthin School; graduated at Cambridge 1603; became a fellow of St. John's College; and took orders in the Church of England 1609. He was successor to Bacon as lord keeper of the great seal July 10, 1621, to Oct. 25, 1626, and was consecrated Bishop of Lincoln Nov. 11, 1621. In the negotiation of the Spanish marriages 1622–23 he took an active part, thereby making a bitter enemy of Buckingham; used his court influence against monopolies and illegal exactions, and displayed moderation in the management of the Star-Chamber tribunal; preached the funeral sermon of James I. 1625; offended the new sovereign, by whom he was dismissed from the keepership the following year; supported the Petition of Right 1628; was three times prosecuted by Archbishop Laud before the Star Chamber on a charge of betraying the king's secrets; was condemned, after eight years' legal proceedings, to imprisonment, suspension from his bishopric, and successive fines of £10,000 and £8,000; was confined four years in the Tower 1636–40, until released by the Long Parliament and restored to his diocese; caused the withdrawal of the bishops from the House of Lords on the occasion of the impeachment of Strafford; advised the king to assent to the execution of that minister; became Archbishop of York Dec. 4, 1641; was soon afterward sent to the Tower with eleven other bishops for protesting against the validity of acts passed during their enforced absence from the House of Lords; was released 1643; was a firm supporter of the king during the great rebellion, and fortified and held Conway Castle. D. at Glodded, Mar. 25, 1650. He wrote a treatise in opposition to Laud's innovations in church ceremonies. His *Life*, under the Latin title *Scrinia reserata* (London, 1693), was written by Bishop John Hacket and by Ambrose Philips (Cambridge, 1700; 2d ed. 1703). In London, 1869, there was privately published the *Correspondence between Archbishop Williams and the Marquis of Ormond.*
Revised by S. M. Jackson.

Williams, John: clergyman; b. at Lampeter, Cardiganshire, Wales, in 1726; became an Independent minister of Socinian views; was noted for classical scholarship, and was pastor of a Dissenting congregation at Sydenham, near London, from 1758 to his death, at Islington, in 1798. Among his works are *A Concordance to the Greek Testament, etc.* (1767); *A Free Inquiry into the Authenticity of the First and Second Chapters of St. Matthew's Gospel* (1771; 2d ed. 1789); and some works on the alleged discovery of America by the Welsh. Revised by S. M. Jackson.

Williams, John: scholar; b. at Ystradmeirig, Cardiganshire, Wales, in 1792; educated at Baliol College, Oxford; took orders in the Church of England; was classical instructor at Winchester College and at Hyde Abbey School; was incumbent of Lampeter, Wales, several years; was appointed, by the influence of Sir Walter Scott, rector of the New Edinburgh Academy; preached the funeral sermon of Scott; and became archdeacon of Cardigan 1833. He was the author of *The Life and Actions of Alexander the Great* (1829; 3d ed. 1860); *Claudia and Pudens, an Attempt to show that Claudia, mentioned in St. Paul's Second Epistle to Timothy, was a British Princess* (Llandovery, 1848); *Gomer, or a Brief Analysis of the Language and Knowledge of the Ancient Cymry* (2 parts, 1854). D. at Bushey Heath, Hertfordshire, Dec. 27, 1858. Revised by H. A. Beers.

Williams, John: missionary; b. at Tottenham, near London, England, June 29, 1796; was apprenticed to an ironmonger, and acquired great skill in mechanical arts; was ordained a minister 1816, and sent by the London Missionary Society to the South Pacific islands; labored several years in the Society islands with great success, acquiring the native languages; visited the Hervey islands, and founded a mission at Raratonga 1823; built with his own hands a vessel 60 feet long, with which for four years he explored the neighboring groups of islands, including the Samoan; returned to England 1834; superintended the publication of the New Testament in the Raratongan language; raised £4,000 for the purchase and outfit of a missionary ship, with which, accompanied by other missionaries, he returned to Polynesia 1838; renewed his explorations, and reached the New Hebrides, where he was about to plant a mission when he was killed and eaten by the cannibals of Erromanga Nov. 20, 1839. He was the author of that famous missionary classic *A Narrative of Missionary Enterprises in the South Sea Islands* (London and New York, 1837; 56th thousand 1865). Several memoirs were published, the most complete being that by Rev. Ebenezer Prout (1843). Revised by S. M. Jackson.

Williams, John, D. D., LL. D.: bishop; b. at Deerfield, Mass., Aug. 20, 1817; was a student at Harvard, but graduated at Trinity College 1835; was tutor and professor in that institution; subsequently trustee and chancellor; studied divinity; ordained deacon in the Protestant Episcopal Church Sept. 2, 1838, and advanced to the priesthood Sept. 26, 1841; was rector of St. George's, Schenectady, N. Y., 1842–48; president of Trinity College 1848–53; became assistant Bishop of Connecticut 1861, and sole bishop Jan., 1865. He is the founder and head of Berkeley Divinity School, Middletown. On the death of Bishop Alfred Lee in 1887, Bishop Williams became the presiding bishop in the Protestant Episcopal Church. Author of *A Translation of Ancient Hymns of the Holy Church* (Hartford, 1845); *Thoughts on the Gospel Miracles* (New York, 1848); *Studies on the English Reformation*, being the Paddock lectures for 1881; *Studies in the Book of the Acts* (1890); and *The World's Witness for Jesus Christ*, the Bedell lecture for 1881; and other religious publications. He edited Bishop Harold Browne's *On the XXXIX. Articles*, with notes.
Revised by W. S. Perry.

Williams, Jonathan: soldier; b. at Boston, Mass., May 20, 1750; was employed in the office of a commercial house in Boston; made frequent business voyages to the West Indies and to England. He was secretary to his grand-uncle Benjamin Franklin, ambassador to France. While abroad he studied the military sciences, and made himself acquainted with standard works on fortification. Returning with his relative in 1785, he resided near Philadelphia, where he was for several years a judge of the court of common pleas. On Feb. 16, 1801, he entered the army. In December he was appointed inspector of fortifications, and took command of the post of West Point and the duties of instruction of the artillerists and engineers. The act of Mar. 16, 1802, fixing the military peace establishment, separated the two corps and provided for the present Military Academy, of which the "principal engineer" should have the superintendency. Under this act Williams was retained as major of engineers (Apr. 1, 1802; lieutenant-colonel July 8, 1802), and at once assumed the duties of superintendent at West Point, where he continued until June 20, 1803, when on a question of rank he resigned from the army. An adjustment of the point at issue was arranged, however, and Apr. 19, 1805, Williams, at the request of President Jefferson, returned to the army as chief engineer, with the rank of lieutenant-colonel, resuming also the superintendency of the Military Academy. While exercising the latter duty he devoted himself personally to the fortifications of New York harbor and most of the forts which constitute its inner line of defense, being promoted colonel and chief engineer Feb. 23, 1808. Fort Columbus, Castles Williams and Clinton (Castle Garden), and a work similar to the last named (Fort Gansevoort) located 2 or 3 miles higher up the river, were planned by him and built under his immediate supervision. Castle Williams was the first "casemated" battery erected in the U. S. (built 1807–10), and was planned after the system of Montalembert, with which Col. Williams had made himself acquainted in France. Upon the declaration of war with Great Britain in 1812 he was at Castle Williams, and being the senior officer present claimed command of that work. The authorities at Washington, however, assigned the command to another, whereupon Col. Williams resigned July 31, 1812. Returning to Philadelphia, he was elected to Congress in 1814, and devoted his leisure to literary pursuits. He was vice-president of the American Philosophical Society; author of a *Memoir on the Use of the Thermometer in Navigation* (1799); *Elements of Fortification* (translation, 1801); *Kosciusko's Movements for Horse Artillery* (1808); of numerous military and philosophical works; and translator of several works on military

science. He was an officer of decided merit, and justly styled the "father of the Corps of Engineers." D. in Philadelphia, Pa., May 16, 1815. Revised by JAMES MERCUR.

Williams, MONIER: See MONIER-WILLIAMS, MONIER.

Williams, OTHO HOLLAND: b. in Prince George's co., Md., in Mar., 1749; entered the Revolutionary army before Boston as lieutenant of a rifle company 1775; became major of a rifle regiment and was wounded and taken prisoner at Fort Washington, N. Y., 1776, but soon exchanged; made colonel of the Sixth Maryland Regiment, with which he accompanied Gen. De Kalb to South Carolina; was adjutant-general of the Southern army under Gens. Gates and Greene from 1780 until the end of the war; rendered efficient service at the battle of Camden and during Greene's retreat, when he commanded a light corps which acted as a rear-guard; took an active part, commanding the Maryland Brigade, at the battles of Guilford and Hobkirk Hill; decided the victory by a brilliant charge at Eutaw Springs; was made brigadier-general May, 1782, and was collector of customs for Maryland from 1783 to his death, July 16, 1794. He wrote a *Narrative of the Campaigns of 1780*. A *Sketch* of his life was published by Osmond Tiffany (Baltimore, 1851).

Williams, ROGER: founder of the State of Rhode Island; b. in London, England, in 1607. He studied at Sutton's Hospital (later the Charter-house School) and graduated at Pembroke College, Cambridge, Jan., 1626. He took orders in the Church of England, and obtained a benefice in Lincolnshire; but soon became a decided Nonconformist or "Separatist." He embarked for New England at Bristol, Dec. 1, 1630, with his wife Mary, on board the ship Lyon, and arrived off Nantasket, Mass., Feb. 5, 1631. He was immediately chosen to supply the pulpit of John Wilson, minister of Boston, during the latter's contemplated visit to England, but declined on the ground that that Church was "an unseparated people." He soon made known some "novel opinions," denying the right of magistrates to punish breaches of the Sabbath or other offenses against religion, coming thereby into collision with the authorities of the colony, and soon afterward he went to Plymouth, where he labored as assistant to Rev. Ralph Smith, a rigid Separatist, supporting himself by manual labor, though also engaging in trade in a limited way. He acquired the Indian language, which stood him in good stead during all his after-life. Leaving Plymouth with a number of adherents in 1633, the Church having refused to sanction "divers of his singular opinions," Williams proceeded anew to Salem, where he assisted Mr. Skelton, though without formal ordination. A treatise which he had written at Plymouth to prove the title of the Massachusetts Company to its lands incomplete without purchase from the Indians, Williams now sent to Gov. Winthrop at the latter's request. Its examination by the Governor and assistants, Dec. 27, 1633, resulted in a vote censuring the author. Williams was nevertheless, on Mr. Skelton's death, Aug., 1634, settled as pastor of the Salem church. The resident's oath, instituted Apr. 8, 1635, Williams refused to take. "He would not renounce an oath which he had taken and substitute another which bound him to obey whatever laws the magistrate might deem wholesome. The reason assigned for the new oath, moreover, was to guard against 'episcopal and malignant practices.' This gave it the appearance of a law to restrain liberty of conscience." Williams was cited before the general court held July 8, when he maintained his opinions in a protracted debate. The Salem people having before the court a claim, which all admitted to be just, for some land at Marblehead Neck, and the court refusing to give them the land so long as the Church stood by Williams, the Salem church sent letters, indited by Williams, to the other churches of the colony, rebuking the magistrates for their "heinous sin," and demanding that they be admonished therefor. This turned public sentiment against the Salem church, and a majority refused to go with Williams further. The Salem church's letter to the other churches and Williams's letter to the Salem church to persuade it to refuse communion with the others till Salem's wrongs were righted, were declared "full of anti-Christian pollution," and brought him before the court again in September. His own church now "had him under question for the same cause, and he, on his return home, refused communion with his own church." Williams's final appearance before the court occurred at Newtown (Cambridge), Oct. 8, 1635, when he was charged with having taught various doctrines subversive of the civil authority and of having "writ letters of defamation both of the magistrates and churches." He maintained his opinions in a formal debate with Rev. Thomas Hooker, whom the court had appointed to try and convince him. On the following day, Oct. 9, the court delivered its sentence. Williams was ordered to depart out of the Massachusetts jurisdiction within six weeks. Subsequently he was permitted to remain in Salem until the next spring, provided he should not "go about to draw others to his opinions." As people resorted to his house to hear him, he was alleged to have violated this condition. In January he was cited to Boston, but declined to go, as by so doing he should hazard his life. Capt. Underhill was dispatched to Salem with a sloop under orders to arrest him and put him aboard ship for England. Underhill came too late, as Williams had been gone three days, "but whither they could not learn." With four companions Williams "steered his course" for the land of the Narragansetts, being "sorely tossed for one fourteen weeks in a bitter winter season, not knowing what bread or bed did mean." Of the Indian chief Ousamequin he purchased a tract of land at Manton's Neck, on the east bank of Seekonk river, and in Apr., 1636, commenced to plant. But his old friend the Governor of Plymouth "lovingly advised" him "that he had fallen into the edge of their bounds." Williams and his associates, William Harris, John Smith, Joshua Verin, Thomas Angell, and Francis Wickes, therefore, about June 1, removed "to the other side of the water," and, landing at a point near the present St. John's church in Providence, began the founding of that city. Making a "covenant of peaceful neighborhood" with the surrounding Indians, they proceeded to frame articles of agreement with one another, binding themselves to subject themselves to the will of the majority "only in civil things." Embracing now the principles of the Baptists, Williams was immersed, and, with some ten companions, in Mar., 1639, formed a Baptist church, but four months later he withdrew from it, and was never again connected with any church. In 1643 he visited England, and obtained a charter for his plantation through the influence of Sir Henry Vane. While in London he printed his *Key into the Language of America, or an Help to the Language of the Natives in that Part of America called New-England, Together with Brief Observations of the Customes, Manners, and Worships, etc., of the Aforesaid Natives in Peace and Warre, in Life and Death, etc.* (1643; new ed. by John Pickering, Providence, 1827), and two controversial treatises—*Mr. Cotton's Letter, Lately Printed, Examined and Answered* (1644) and *The Bloudy Tenent of Persecution for Cause of Conscience, discussed, in a Conference betweene Truth and Peace, etc.* (1644), which elicited replies from Cotton and others. He returned to Providence 1644, landing at Boston in September, but refused to act as governor of the colony. He again visited England to secure a confirmation of the charter, starting in Nov., 1651, remaining in London between two and three years, and returning in June, 1654. He was for some time a teacher of the Hebrew, Greek, Latin, French, and Dutch languages, employing the conversational method of instruction. He became acquainted with Cromwell and Milton, and was intimate with Sir Henry Vane. With Mrs. Anne Sadleir, daughter of his early patron, Sir Edward Coke, Williams had a curious correspondence. He published *The Bloody Tenent yet more Bloody, by Mr. Cotton's endeavour to wash it white in the Blood of the Lambe, etc.* (1652); *The Hireling Ministry none of Christ's, or A Discourse touching the Propagating the Gospel of Christ Jesus, etc.* (1652): and *Experiments of Spiritual Life and Health, and their Preservatives* (1652). He returned to Providence early in 1654. He was president of the colony 1654–58, rendering important services to the neighboring colonies, as he had earlier done, by his influence with the Indians and by giving warning of impending hostilities. He refused to sanction in 1672 the proposed exclusion of Quakers from Rhode Island, but engaged in public debate, both at Newport and at Providence, with three Quaker preachers (Stubbs, Burnet, and Edmundson), and published *George Fox digg'd out of his Burrowes, or an Offer of Disputation on fourteen Proposalls made this last Summer 1672 (so call'd) unto G. Fox, then present on Rhode-Island in New-England* (Boston, 1676), which elicited Fox's violent rejoinder: *A New England Fire-Brand Quenched, etc.* (1679). D. at Providence between Jan. 18 and Apr. 25, 1683. He was buried on his own estate, where a monument has been erected by his descendants. A statue of him

has also been placed by Rhode Island in the Capitol in Washington. D. C. His *Letters* (sixty-five in number) to the two Governors Winthrop were printed by the Massachusetts Historical Society (1863). The Narragansett Club has published a carefully prepared edition of his works (6 vols., 1866–75). There are biographies by J. D. Knowles (Boston, 1833), William Gammell (1846), Romeo Elton (London, 1852), Oscar S. Straus (1894). See also Samuel G. Arnold's *History of Rhode Island* (vol. i., 1860); Rev. Henry M. Dexter's *As to Roger Williams and his so-called "Banishment" from the Massachusetts Plantation* (Boston, 1876); and Henry F. Waters in *New England Genealogical Register* (July, 1889, pp. 291, *seq.*) What immortalizes Roger Williams and gives him a high place among the greatest characters of history is that, in spite of towering difficulties, he founded a State—the first in history—which was creedless itself, while welcoming and protecting all creeds whatsoever, thus giving to the principle of separation between Church and state that lodgment in American public law which led later to its adoption into the national Constitution. E. BENJ. ANDREWS.

Williams, ROWLAND, D. D.: clergyman and author; b. at Halkyn, Flintshire, Wales, Aug. 16, 1817; educated at Eton and at King's College, Cambridge, and graduated 1841; became fellow and tutor there; took orders in the Church of England, identifying himself with the "Broad Church" movement headed by Arnold and Maurice; was prominent in connection with university reform; became chaplain to the Bishop of Llandaff; vice-principal and Professor of Hebrew at St. David's College, Lampeter, 1850; became vicar of Broad Chalk, Wiltshire, 1859; was prosecuted before the court of Arches for having contributed to the famous volume of *Essays and Reviews*, and was condemned Dec., 1862, but obtained a reversal of judgment from the Privy Council Feb., 1864; resigned his professorship 1862, and resided thenceforth at his vicarage of Broad Chalk, near Salisbury, where he died Jan. 18, 1870. He wrote *Rational Godliness* (London, 1855): *Christianity and Hinduism* (1856); *A Letter to the Lord Bishop of St. David's* (1860); *The Hebrew Prophets, a New Translation* (2 vols., 1868–71); *Broad Chalk Sermon-essays* (1867); *Owen Glendower* (1870); and *Psalms and Litanies* (1872). See his *Life and Letters* (2 vols., 1874) by his widow. Revised by S. M. JACKSON.

Williams, SAMUEL WELLS, LL. D.: missionary and Sinologist; b. at Utica, N. Y., Sept. 22, 1812; graduated at the Rensselaer Polytechnic Institute at Troy, N. Y., 1832; went to Canton, China, as printer to the American mission 1833; assisted in editing the *Chinese Repository*; completed at Macao the printing of Medhurst's *Dictionary*; visited Japan to return some shipwrecked sailors 1837; learned the Japanese language, into which he translated the books of Genesis and Matthew; aided Dr. Bridgman in preparing his *Chinese Chrestomathy*; published *Easy Lessons in Chinese* (Macao, 1842), *The Chinese Commercial Guide* (1844), and *An English and Chinese Vocabulary in the Court Dialect* (1844); visited the U. S. 1845, delivering lectures on China, and procuring from Berlin a new font of Chinese type; published *The Middle Kingdom, a Survey of the Geography, Government, Education, Social Life, Arts, Religion, etc., of the Chinese Empire and its Inhabitants* (2 vols., 1848; 3d ed. 1857; revised ed. 1883), which is still considered the best work of the kind on that country; returned to China 1848; edited the *Chinese Repository* until 1851, when it was discontinued; accompanied Commodore Perry as interpreter on his expedition to Japan 1853–54; published a *Tonic Dictionary of the Chinese Language in the Canton Dialect* (1856); aided Hon. William B. Reed in the negotiation of the Treaty of Tientsin 1858; accompanied Mr. Ward to Peking to exchange the ratifications of 1859; revisited the U. S. 1860–61; went to reside at Peking as secretary of the U. S. legation 1862, then first established in the capital of China; published a fifth edition of the *Commercial Guide* (1863), nearly rewritten; completed and brought out the great work of his life, *The Syllabic Dictionary of the Chinese Language* (4to, Shanghai, 1874); returned to the U. S. in 1875 and settled at New Haven, Conn., where he was appointed Professor of Chinese at Yale College, and where he died Feb. 16, 1884. A new edition of his *Tonic Dictionary*, revised by Dr. Eitel, was published by the British authorities at Hongkong 1876. During the last years of his life he was president of the American Bible Society (elected Mar. 3, 1881), and also of the American Oriental Society.

Williams, STEPHEN, D. D.: clergyman; son of Rev. John Williams, the "redeemed captive"; b. at Deerfield, Mass., May 14, 1693; was carried captive with his family to Canada by the Indians Mar., 1704; was bought of the Indians by the French governor of Canada, and sent to Boston before the rest of his family, arriving there Nov. 21, 1705; not long afterward wrote a minute narrative of his experiences in captivity; graduated at Harvard 1713; taught school at Hadley 1713–14; was ordained minister of Longmeadow, Mass., Oct. 17, 1716; was chaplain of a regiment in Sir William Pepperell's expedition against Louisburg 1745, of Col. Ephraim Williams's regiment in the expedition to Lake George 1755, and of Col. Thomas Williams's regiment in the campaign of 1756; visited the Housatonic Indians at Stockbridge, Mass., 1734, and was instrumental in the establishment of a mission among them. D. at Longmeadow, Mass., June 10, 1782.

Williams, WILLIAM: one of the signers of the Declaration of Independence; son of Rev. Solomon Williams; b. at Lebanon, Conn., Apr. 18, 1731; graduated at Harvard; served on the staff of his relative, Col. Ephraim Williams, in the expedition to Lake George 1755; became a merchant at Windham; was long the town-clerk and justice of the peace; was frequently elected to the provincial assembly, of which he was for many years speaker; was afterward a member of the council, of the committee of safety, and of the Continental Congress 1776–77 and 1783–84; was a signer of the Declaration of Independence; and contributed by his pen and his estate to the cause of independence, expending nearly his entire fortune in the patriot cause. D. at Lebanon, Conn., Aug. 2, 1811.

Williams, Sir WILLIAM FENWICK: soldier; b. in Halifax, Nova Scotia, Dec. 4, 1800, and entered the Royal Artillery in 1825. Having been much employed in Turkey prior to 1848, he was in June of that year appointed British commissioner for the settlement of the Turco-Persian boundary, and in 1854 was made British commissioner with the Turkish army in the East, with the local rank of brigadier-general. His gallant defense of Kars in 1855 won him the promotion to major-general, and he was created a baronet and Knight of the Bath. The order of the Medjidie and the grand cross of the Legion of Honor of France were also bestowed on him. He was a member of Parliament for Calne 1856–59; was in command of the troops in Canada from 1859 to 1865, governor and commander-in-chief of Gibraltar 1870–76; retired 1877. D. in London, July 26, 1883.

Williamsbridge: former village in Westchester co., N. Y.; annexed to New York in 1895; on the Harlem division of the N. Y. Cent. and Hud. Riv. and the N. Y., N. H. and Hart. railways; 13 miles from the New York city-hall (for location, see map of the city of New York, ref. 3–F). It contains 6 churches, 2 public schools, and a part of Bronx Park, and has a weekly newspaper. Pop. (1890) 1,685; (1895) estimated, 4,500. EDITOR OF "COURIER."

Williamsburg: town (founded in 1818); capital of Whitley co., Ky.; on the Cumberland river, and the Louisville and Nashville Railroad; 17 miles S. of Corbin, 100 miles S. by E. of Lexington (for location, see map of Kentucky, ref. 5–I). It is in a coal-mining region, and has 6 churches, 5 public schools, an academy, a college, a State bank with capital of $60,000, 2 weekly newspapers, 3 large saw-mills, and 2 planing-mills. Pop. (1880) 208; (1890) 1,376; (1900) 1,495. EDITOR OF "TIMES."

Williamsburg: town (incorporated in 1771); Hampshire co., Mass.; on the Mill river, and the N. Y., N. H. and Hart. Railroad; 8 miles N. W. of Northampton (for location, see map of Massachusetts, ref. 2–D). It contains the villages of Williamsburg, Haydenville, and Searsville; has a high school, 15 district schools, public library, 3 churches, and a savings-bank (Haydenville); and is principally engaged in agriculture and the manufacture of hardware and brass goods. The bursting of a dam on Mill river at Haydenville in 1874 caused the loss of many lives and the destruction of much property. The assessed valuation of the town in 1894 was $878,031. Pop. (1880) 2,234; (1890) 2,057; (1900) 1,926.

Williamsburg: city; capital of James City co., Va.; on the Ches. and Ohio Railway; 3 miles N. of the James river, 50 miles S. E. of Richmond (for location, see map of Virginia, ref. 6–I). It is on an elevated plateau between the James and York rivers, about equidistant from either stream; was first settled in 1632; is the oldest incorporated city in the State, and abounds in historic interest. Prior to

the Revolution it was the seat of the royal government, and subsequently, until 1779, the capital of the State. The Capitol was destroyed by fire in 1748, and rebuilt; the latter building was also burned about 1830. The Eastern lunatic asylum, located here, authorized in 1769 and opened in 1773, is the oldest of the kind in the U. S. Williamsburg is also the seat of WILLIAM AND MARY COLLEGE (*q. v.*). Pop. (1880) 1,480; (1890) 1,831; (1900) 2,044. LEONARD HENLEY, MAYOR.

Williamsburg, Battle of: a conflict during the civil war in the U. S., occurring May 5, 1862. The Confederates evacuated Yorktown on May 4 and fell back toward Richmond. McClellan, sending forward in pursuit the Third and Fourth Corps, preceded by the cavalry under Stoneman and followed the next day by the Second Corps, all under the command of Gen. E. V. Sumner, remained at Yorktown superintending the embarkation of the rest of the army on transports for transfer by water to West Point. Stoneman's advance overtook the Confederate cavalry of the rear guard near the Halfway House, from which point it fell back skirmishing until it occupied a line of twelve redoubts previously constructed as a defensive line across the Peninsula near Williamsburg. Here it was re-enforced, and became strong enough to stop Stoneman's advance. The Union infantry coming up was deployed for the attack, but the lateness of the hour, Hooker's troops not being in position till 11 P. M., and the fact that the ground was covered with woods and tangled undergrowth, led to the postponement of the attack until morning. In the early morning of the 5th the battle was begun by Hooker, whose Third Corps occupied the left of the line. His attack at first promised success, but the Confederates sending back the rest of Longstreet's division, he was held in check, and at about noon was driven back; losing some ground which was regained when Kearny's division came to his support at about 2 P. M. The battle in this part of the field was continued until night without gain on either side. Meanwhile, on the Union right an advance was made under Gen. W. F. ("Baldy") Smith's direction. Hancock, commanding his own brigade and a part of Davidson's, pushed forward across a creek and occupied an abandoned redoubt, from which he advanced and made a vigorous attack upon the enemy's left, with a view to relieving Hooker from the pressure upon him. The Confederates brought up four regiments to meet this attack. Hancock fell back to his position near the redoubt, where he had open ground in his front, and when the Confederates emerged from the woods, turned upon and repulsed them, inflicting upon them a heavy loss. The Confederate left fell back out of fire and remained in line of battle until it joined the rest of the army, when, during the night, it abandoned Williamsburg and retired toward Richmond. The Union losses on May 4 and 5 were 2,283 in killed, wounded, and missing. The Confederates report a loss of 1,560 men. See *Battles and Leaders of the Civil War*; A. S. Webb, *The Peninsula*; and *Official Record*, etc. JAMES MERCUR.

Williams College: an institution of learning in Williamstown, Berkshire co., Mass. It owes its origin and name to Col. Ephraim Williams, who fell in 1755 near Lake George in the French and Indian war. On his way to the field of battle, at the city of Albany, he made his will, devoting the bulk of his property to the founding of an institution of learning, which in 1793 was chartered as Williams College. Rev. Ebenezer Fitch, D. D., who had been the principal of the school up to the time of its incorporation as a college, became its first president, and continued such till 1815. The catalogue published in 1795 contained seventy-seven names; the largest number of students under President Fitch was 144. Rev. Zephaniah Swift Moore succeeded him, resigning in 1821. Rev. Edward Dorr Griffin, D. D., followed, and held the office with distinguished success till 1836. What is now known as Griffin Hall was then built, and funds were raised for the library, for the aid of indigent students, and for other general purposes of the college. After Dr. Griffin came Rev. Mark Hopkins, D. D., LL. D., who after a successful presidency of thirty-six years, resigned in 1872. During this period the college grounds were greatly extended, several buildings erected, its corps of instructors enlarged, and an endowment amounting to nearly $300,000 secured. The next head of the college was Hon. Paul A. Chadbourne, LL. D., formerly president of the State University of Wisconsin, who was succeeded by Prof. Franklin Carter, LL. D., in 1881, under whose management a large extension in endowments and buildings and equipments has taken place. At Williams College in 1806 the first foreign missionary society formed in the U. S. originated in connection with Samuel J. Mills and his associates. Here, under Prof. Hopkins, was erected the first permanent astronomical observatory connected with a college in North America. Here, also, under Profs. Emmons and Hopkins, originated the first of those college scientific expeditions now so common, followed in later years by others to Labrador, Greenland, Florida, South America, and Central America. The condition of the college at present is highly prosperous; its libraries contain more than 40,000 volumes; its cabinet, recitation-rooms, appliances, and apparatus are of the best order; it has twenty-nine professors, instructors, and assistants; its funds and securities amount to more than $1,000,000; a college hall has been erected where board is furnished at cost. There are a number of scholarships, and an ample charitable fund. Revised by FRANKLIN CARTER.

Williamson: town; Wayne co., N. Y.; on Lake Ontario, and the Rome, Water, and Ogdens, Railroad; 6 miles W. of Sodus, 15 miles E. by N. of Rochester (for location, see map of New York, ref. 4–E). It contains the villages of Williamson, East Williamson, and Poultneyville, and has a grain elevator, flour-mills, box-factory, mineral spring, private bank, and a weekly and a monthly periodical. Pop. (1880) 2,745; (1890) 2,670; (1900) 2,670.

Williamson, HUGH, M. D., LL. D.: physician and statesman; b. at West Nottingham, Pa., Dec. 5, 1735; graduated at the University of Pennsylvania 1757; studied theology and occasionally preached; was Professor of Mathematics in the University of Pennsylvania 1760–63; studied medicine at Edinburgh and Utrecht, where he took his degree; practiced at Philadelphia; observed the transits of Venus and of Mercury for the Philosophical Society 1769; visited the West Indies 1772 and England 1773 to procure aid for the academy at Newark, Del.; was examined before the privy council 1774 on the subject of the destruction of tea; spent two years on the Continent 1774–76; engaged in mercantile business at Charleston, S. C., 1777; subsequently settled and practiced medicine at Edenton, N. C.; was a surgeon in the Continental service 1781–82; was a member of the North Carolina Legislature, a delegate to the Continental Congress 1782–85 and 1787–88, to the Federal constitutional convention 1787, and to the State convention that ratified the Constitution 1789, and a member of Congress 1790–93; removed afterward to New York, and was one of the founders of the Literary and Philosophical Society in 1814. D. in New York, May 22, 1819. He published various medical and scientific treatises, and a *History of North Carolina* (2 vols., 1812).

Williamson, ROBERT STOCKTON: soldier; b. in New York in 1824; graduated at the U. S. Military Academy July, 1848. In the civil war he served as chief topographical engineer at the capture of Newberne and Fort Macon, N. C. (Mar.–Apr., 1862), gaining the brevet of lieutenant-colonel for gallantry at the siege of Fort Macon; subsequently engaged in fortifying Newberne until August, when transferred to the Army of the Potomac. Ordered to the Pacific coast in 1863 (in May of which year he attained a majority in the Corps of Engineers), he was for a short time chief topographical engineer of the department, and retained on the staff of the general commanding, until Dec., 1865. From Feb., 1863, he performed the duties of lighthouse engineer, besides having charge at times of the improvement of rivers and harbors on the Pacific coast and of surveys in California and Oregon. Promoted lieutenant-colonel Corps of Engineers Feb., 1869; retired for physical disability June, 1882. In 1868 he published a valuable work *On the Use of the Barometer on Surveys and Reconnoissances* (New York). D. Nov. 10, 1882. Revised by JAMES MERCUR.

Williamsport: city (founded in 1827); capital of Warren co., Ind.; on the Wabash river, and the Wabash Railroad; 24 miles S. W. of Lafayette, 25 miles N. E. of Danville, Ill. (for location, see map of Indiana, ref. 5–B). It is in an agricultural and stock-raising region; has 5 churches, high school, graded school, 2 State banks (combined capital, $100,000), 2 weekly papers, a building-stone quarry, large grist-mill, electric lights, and several warehouses. Within a distance of 3 miles are extensive coal mines and the Indian mineral springs. Pop. (1880) 913; (1890) 1,027; (1900) 1,245. EDITOR OF "THE REVIEW."

Williamsport: town (founded in 1787); Washington co., Md.; on the Potomac river, the Chesapeake and Ohio Canal, and the Cumberland Valley and the West. Md. railways; 6

miles S. W. of Hagerstown, the county-seat, 15 miles N. N. E. of Martinsville (for location, see map of Maryland, ref. 1–C). It is in a timber region, has excellent water-power, and contains 6 churches, 6 schools for white children and 1 for colored, several flour-mills, sash and door factories, and a national bank with a capital of $100,000. There are 2 weekly newspapers. The city has an extensive trade in bituminous coal and grain. The Confederate army under Gen. Lee crossed the Potomac at this point in June, 1863, when advancing to Gettysburg. Pop. (1880) 1,503; (1890) 1,277; (1900) 1,472. EDITOR OF "LEADER."

Williamsport: city (selected for county-seat in 1795, chartered as a city in 1866); capital of Lycoming co., Pa.; on the Susquehanna river, and the Beech Creek, the Williamsport and North Branch, the Fall Brook, the North. Cent., the Penn., and the Phil. and Read. railways; 96 miles N. of Harrisburg, 202 miles N. W. of Philadelphia (for location, see map of Pennsylvania, ref. 3–F). It is built on a plain along the river at the base of hills; is regularly laid out, paved with asphalt, wood, brick, and macadam, supplied with water from mountain springs piped beneath the river, and lighted with gas and electricity; and has a steam-heating plant. Local and suburban transit is promoted by five electric railways. The city has 3 public parks, 2 race-courses, Dickinson Seminary, City Hospital, City Mission, Women's Christian Home, Girls' Industrial Home, Y. M. C. A. building, public library, 5 national banks, a State bank, an incorporated and a private bank, with combined capital of $1,226,000 and surplus of $97,000, and 4 daily, 8 weekly, and 4 monthly periodicals. It derives its prosperity from its lumber manufactures and diversified industries. The Susquehanna boom, which cost over $1,000,000, is located here, and catches all logs cut from the vast forests of pine and hemlock on the western branch of the river and its tributaries. There are about 30 sawmills, picket, lath, and shingle mills, sash, door, and blind factories, rubber works, silkmill, sewing-machine works, iron furnace, furniture, soap, paint, glue, and carriage and wagon factories, boiler-works, and manufactories of wood-working machinery. Pop. (1880) 18,934; (1890) 27,132; (1900) 28,757.
JAMES W. SWEELY, EDITOR OF "THE SUN."

Williamston: village; Ingham co., Mich.; on the Det., Lans. and N. Railroad; 14 miles E. by S. of Lansing, 32 miles N. by E. of Jackson (for location, see map of Michigan, ref. 7–I). It is in an agricultural, coal, and fire-clay region, and has Baptist, Congregational, Methodist Episcopal, and Roman Catholic churches, two public-school buildings, a State bank with capital of $50,000, and a weekly paper. Pop. (1890) 1,139; (1900) 1,113. EDITOR OF "ENTERPRISE."

Williamstown: town (incorporated in 1765); Berkshire co., Mass.; on the Hoosac and Green rivers, and the Fitchburg Railroad; 5 miles W. of North Adams, with which it is connected by electric railway, and 42 miles E. of Troy, N. Y. (for location, see map of Massachusetts, ref. 2–C). It contains the villages of Williamstown, South Williamstown, Blackington, Sweet's Corners, and Williamstown Station, and has excellent water-power for manufacturing. There are a high school, 21 district schools, public library, 6 churches, 4 hotels, a national bank with capital of $50,000, and a weekly and a monthly periodical. The town is principally engaged in bleaching and the manufacture of woolen goods; and has the extensive freight yards of the Fitchburg Railroad. Williamstown is widely noted as the seat of WILLIAMS COLLEGE (*q. v.*). Pop. (1880) 3,394; (1890) 4,221; (1900) 5,013. EDITOR OF "WILLIAMS WEEKLY."

Williamstown: borough; Dauphin co., Pa.; on the North. Cent. and the Williams Val. railways; 20 miles E. of Millersburg, about 50 miles N. E. of Harrisburg (for location, see map of Pennsylvania, ref. 5–G). It is in a mining and coal-shipping region and has 9 churches, 12 schools, 6 hotels, 2 public halls, 2 weekly newspapers, and hosiery-mills and coach-shops. Pop. (1880) 1,771; (1890) 2,324; (1900) 2,934. EDITOR OF "TIMES."

Williamstown: town; Orange co., Vt.; on the Cent. Vt. Railroad; 10 miles N. W. of Chelsea, 12 miles S. of Montpelier (for location, see map of Vermont, ref. 6–C). It has three churches, a library (founded in 1801), hotel, and manufactories of harness, granite monuments, lumber, shingles, and grist. Pop. (1880) 1,038; (1890) 1,188; (1900) 1,610.

Willibrod: See WILIBRORD.

Williman'tic: city (incorporated as a borough in 1833, chartered as a city in 1893); Windham co., Conn.; at the junction of the Williamantic and Natchaug rivers, which here form the Shetucket, and on the Cent. Vt. and the N. Y., N. H. and Hart. (Midland, Highland, Central, and Air Line Divisions); 16 miles N. by W. of Norwich, 32 miles E. by S. of Hartford (for location, see map of Connecticut, ref. 8–J). It is picturesquely situated between the two rivers, has exceptional water-power from a fall of 91 feet in the Williamantic river within the city limits, and contains numerous manufactories in the two valleys. The city owns improved water and sewerage systems, is the city in the county, and is the trade center of a region having 25,000 inhabitants. There are Baptist, Congregational, Methodist Episcopal, Protestant Episcopal, Swedish Lutheran, African Methodist Episcopal Zion, Roman Catholic, Spiritualist, Unitarian, and Christian Believers churches and missions. The educational institutions include a State Normal-training School, with model schools attached (building completed in 1895, cost $125,000), Central Public High School, Natchaug graded schools, and St. Joseph's parochial school. There are two libraries, the Public (founded in 1864) and Dunham Hall (founded in 1878).

Grand list in 1899, $4,041,250.40; indebtedness, funded, $300,000; floating, $57,645; sinking fund, $7,319.44; rate of taxation, 12 mills. One national bank with a capital of $100,000, and two savings-banks, a flourishing building and loan association, and a daily and two weekly newspapers. The principal industries are the manufacture of thread, spools, silk, print cloths, cotton warps, silk machinery, carriages, and there are also an iron-foundry, a grain elevator, and a quarry. The largest plant of the American Thread Company is located here, employing 2,200 hands. Pop. (1880) 6,608; (1890) 8,648; (1900) 8,937.
A. N. COLGROVE, "DAILY CHRONICLE."

Willis, NATHANIEL PARKER: author; son of Nathaniel Willis, editor; b. at Portland, Me., Jan. 20, 1806; studied at the Boston Latin School and at Phillips Academy, Andover; graduated at Yale College 1827; gained while an undergraduate a prize of $50, offered by the *Album* for the best poem, and wrote for his father's paper, the *Boston Recorder*, some religious poems which are still much admired, and were reprinted by S. G. Goodrich under the title *Sketches* (Boston, 1827); edited for Mr. Goodrich ("Peter Parley") two annuals, *The Legendary* (1828) and *The Token* (1829); founded and conducted at Boston *The American Monthly Magazine* (1829–31) until it was merged in the New York *Mirror* (1823–42), of which he became in 1831 associate editor with George P. Morris; traveled in Europe and Asia Minor 1831–36, seeing much of the best literary society, which he described with abundance of personal details in letters to the *Mirror*, collected under the title *Pencillings by the Way* (3 vols., London, 1835, and more completely at New York, 1844); married in England in 1835 Miss Mary Leighton Stace; wrote for numerous English magazines; returned to the U. S. 1836; settled on a beautiful estate on the Susquehanna, near Owego, N. Y., which he called "Glen Mary"; founded, with Dr. T. A. Porter in 1839, a short-lived weekly literary paper, *The Corsair*; revisited Europe in 1839; discontinued the *Mirror* Dec. 31, 1842; conducted, with Gen. Morris, two daily papers, *The New Mirror* (Apr. 8, 1843, to Sept. 28, 1844) and *The Evening Mirror* (Oct. 7, 1844, to end of 1845); lost his wife, and went to Europe for his health 1845–46; published numerous volumes of European correspondence; married Miss Grinnell, of New Bedford, 1846, and established in 1853 a new home at "Idlewild," near Newburg, on the Hudson; joined his friend Morris (Nov., 1846) in the editorship of a new weekly paper, the *Home Journal*, upon which he continued to be occupied until his death, at Idlewild, Jan. 20, 1867. Among his numerous works were *Inklings of Adventure* (3 vols., 1836); *Loiterings of Travel* (3 vols., New York, 1840); *Letters from under a Bridge* (London, 1840); *People I have Met* (1850); *Hurry-graphs* (1851); *A Health-trip to the Tropics* (1854); *Famous Persons and Places* (1854); *The Convalescent, his Rambles and Adventures* (1859); and a volume of *Poems*, which appeared in many editions, some of them richly illustrated. Willis was for many years the most brilliant and popular American magazinist. His published writings (of which a "complete" edition was published in one volume in 1846; *Complete Poems* in one volume in 1868; and *Prose Works* in 13 volumes in 1849–59) include stories, sketches of travel, miscellaneous papers of social observation, and verses secular and religious. See *Nathaniel Parker Willis*, by Henry A. Beers (Boston, 1885).

Willis, Thomas, F. R. S.: physician and author; b. at Great Bedwin, Wiltshire, England, Jan. 27, 1621; studied at Christ Church, Oxford; took the degree of bachelor of medicine 1646; served in the royalist ranks during the great rebellion; practiced his profession at Oxford; became Sedleian Professor of Natural Philosophy in the university at the Restoration; afterward settled in London; was one of the founders of the Royal Society; became physician to Charles II. 1666; and the same year removed to Westminster. He published several medical works, written in good Latin, of which the most important were *Cerebri Anatome, cui accessit Nervorum Descriptio et Usus* (1664); *Pathologiæ Cerebri et Nervosi Generis Specimina* (1667); and *De Anima Brutorum* (1672). His complete works were posthumously published in Latin (2 vols., Geneva, 1676; Amsterdam, 1682) and in English, translated by Roger l'Estrange (folio, 1679). D. at St. Martin's, London, Nov. 11, 1675, and was buried in Westminster Abbey.

Willmar: village (founded about 1868); capital of Kandiyohi co., Minn.; on Foot Lake, and the Great North Railway; 92 miles W. by N. of Minneapolis (for location, see map of Minnesota, ref. 9–C). It is in an agricultural and dairying region, and has 9 churches, 2 public-school buildings, court-house, jail, 2 State banks (combined capital, $90,000), and 2 weekly newspapers. Pop. (1880) 1,002; (1890) 1,825; (1900) 3,409. Editor of "Republican Gazette."

Willmore, James Tibbits: engraver; b. at Handsworth, Staffordshire, England, Sept. 15, 1800; became one of the most eminent of the landscape-engravers who distinguished themselves by their reproductions of the masterpieces of Turner, and was made an associate of the Royal Academy 1843. Among his prints of Turner are *Mercury and Argus*, *The Fighting Téméraire*, and *Ancient Italy*. He also engraved several notable pictures by Eastlake, Landseer, Stanfield, and Creswick. D. Mar. 12, 1863.

Will-o'-the-Wisp: See Ignis Fatuus.

Willoughby: village (settled under the name of Chagrin about 1794); Lake co., O.; on the Chagrin river, and the Lake Shore and Mich. S. and the N. Y., Chi. and St. L. railways; 3 miles E. of Lake Erie, 18 miles N. E. of Cleveland (for location, see map of Ohio, ref. 1–I). It is in a grape and fruit growing region; has five churches, high and graded schools, water-works, electric lights, a private and a branch bank, and a weekly and a quarterly periodical; and is principally engaged in the manufacture of brick and tile machinery and fruit and market baskets and in shipping cheese, milk, and fruit. Pop. (1880) 1,001; (1890) 1,219; (1900) 1,753. Editor of "Independent."

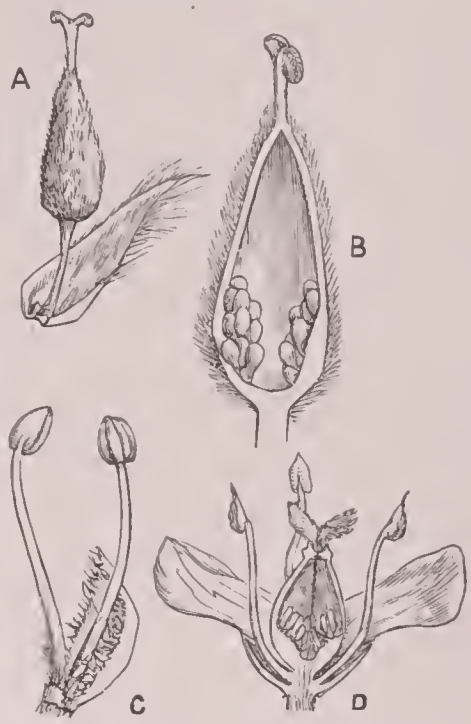
Willoughby, Sir Hugh: explorer; supposed to have been born at Risby, Derbyshire, England, about 1500; acquired military experience in the continental wars; was chosen commander of an expedition fitted out by the Merchants Adventurers at the instance of Sebastian Cabot, and received from Edward VI. a "license to discover strange countries"; fitted out three vessels, one of them under the command of Richard Chancellor; sailed from Deptford May 10, 1553; proceeded to the Arctic regions by the coasts of Norway; but his vessel, having become separated from the others, was detained in the ice somewhere upon the northern coast of Lapland. By a journal, supposed to be his, which was recovered from the Russians, it appeared that his company was living in Jan., 1554, but when his vessel, the Bona Speranza, was discovered in the spring of 1554, all the inmates were dead. Richard Chancellor, with his vessel, the Edward Bonaventura, discovered the port of Archangel, and thus gave rise to direct commerce with Russia, which did not then extend to the Baltic. A journal of Sir Hugh's voyage to Sept., 1553, is printed in Hakluyt, from a MS. in the handwriting of Michael Lok.

Willow [M. Eng. *wilowe, wilwe* < O. Eng. *wilig*: O. Dutch *wilge* > Dutch *wilg*]: any tree or shrub of the genus *Salix*, of which there are over 160 well-recognized species, besides innumerable varieties. Many of the long-leaved shrubby sorts are used in basket-making, and the larger, short-leaved kinds, called *sallows* in England, are in Europe raised in copses for hoop poles; for charcoal, to be used in gunpowder-making; for fence-poles, which when peeled and dried are very durable; for vine-props, hoe-handles, and the like. Willow-wood is also used for steamboat paddles, cricket-bats, and surgeons' splints. It is light, tough, and stands exposure in water very well. Salicine, an active principle from willow-bark, is very useful in medicine. The *S. babylonica*, or weeping-willow, has long been an emblem of grief. It is much planted as an ornamental tree. There are about 100 species of willow in North America.

Revised by L. H. Bailey.

Willow-apple: See Gall Insects.

Willow Family: the *Salicaceæ*; a small group (about 200 species) of dicotyledonous trees and shrubs with alternate leaves, and diœcious, apetalous flowers in catkins. The ovaries are free, two to four carpellary, with as many basal-parietal placentæ, each with usually many ovules; seeds with a tuft of hairs on the funiculus. Upon comparison of the structure of the willow flowers with those of the Tamarisk Family (*q. v.*) their similarity may readily be seen. The principal differences are due to the reduction of the willow flowers, whereby they have become diclinous and apetalous. The pistils, placentæ, ovules, and seeds show striking similarities. It is interesting to note that in both families many living twigs detach themselves spontaneously in the autumn; this is notably the case with the cottonwood tree (*Populus monilifera*).



A, pistillate flower of willow; B, vertical section of pistil; C, staminate flower of willow; D, section of a flower of the tamarisk, for comparison. All magnified.

The species of this family are widely distributed in the northern hemisphere, but are scarcely found S. of the equator, South Africa and Chili having but one each, while they are wanting in Australia, the Malayan region, and the South Pacific islands. About seventy-five species are natives of North America, of which nine belong to the genus *Populus* (the poplars, cottonwoods, etc.), the remainder being true willows (*Salix*). Charles E. Bessey.

Willow Grouse, or **Ptarmigan**: a gallinaceous bird, the *Lagopus albus*; found in the northern regions of the Old and New Worlds. See Ptarmigan.

Willow Herb: See Epilobium.

Willows: town (laid out in 1876); capital of Glenn co., Cal.; on the South Pac. Railroad; 21 miles N. of Colusa, 151 miles N. by E. of San Francisco (for location, see map of California, ref. 5–C). It is in an agricultural and fruit-growing region; was named from a willow-grove, the only one for miles around, in the center of the town; and has 5 churches, high and district schools, county court-house (erected in 1894 at a cost of $150,000), a State bank with capital of $300,000, and a daily and 2 weekly newspapers. Pop. (1880) 750; (1890) 1,176; (1900) 893.

Publisher of "Journal."

Willow Springs: city; Howell co., Mo.; on the Kans. City, Ft. Scott and Mem. Railroad; 21 miles N. W. of West Plains (for location, see map of Missouri, ref. 8–H). It is in an agricultural and fruit-growing region, and has a State bank and 2 newspapers. Pop. (1890) 1,535; (1900) 1,078.

Wills, Sir Alfred: See the Appendix.

Wills, William Gorman: dramatist; b. in County Kilkenny, Ireland, in 1830; educated at Trinity College, Dublin; studied art at the Royal Irish Academy; was a portrait-painter at Dublin and in London; author of *Notice to Quit* (3 vols., 1861) and *The Life's Evidence* (3 vols., 1863), both republished in the U. S., and of several successful dramas, among which are *Charles the First* (1872); *Eugene Aram* (1873); *Marie Stuart* (1874); *Jane Shore* (1876); *Olivia* (1878); *Nell Gwynne* (1878); *Black-eyed Susan* (1880); *Sedgemoor* (1881); *Claudian* (1885); *A Royal Divorce* (1891); and in conjunction with Sydney Grundy, *Madame Pompadour*. D. in London, Dec. 14, 1891.

Wills, William John: physician and explorer; b. at Totnes, Devonshire, England, Jan. 5, 1834; educated at the Ashburton grammar school; was apprenticed to his father, Dr. William Wills; pursued his medical studies also in London; emigrated to Australia Oct., 1852; was joined there in the following year by his father, with whom he practiced medicine at Ballarat; became a surveyor; was appointed assistant in the magnetic observatory at Melbourne Nov., 1858; joined the expedition headed by O'Hara Burke for the exploration of the interior of the continent, leaving Melbourne Aug. 20, 1860; crossed the entire continent northward through the deserts, reaching the Gulf of Carpentaria in Jan., 1861, but on their return both Burke and Wills died of starvation near Cooper's creek about July 1, 1861. The journal kept by the latter was recovered and published by his father, *A Successful Exploration from Melbourne to the Gulf of Carpentaria, from the Journals and Letters of William John Wills* (1863).

Willson, David Burt, M. D., D. D.: educator and editor; b. in Philadelphia, Pa., Sept. 27, 1842; educated at the University of Pennsylvania, Jefferson Medical College, Philadelphia, and the Reformed Presbyterian Seminary, Allegheny, Pa.; was in medical service in the U. S. army in 1862, and again in 1863–65; pastor of the Reformed Presbyterian church, Allegheny, 1870–75; and since 1875 Professor of Biblical Literature in the Reformed Presbyterian Seminary, Allegheny. Since 1874 Dr. Willson has been an editor of the *Reformed Presbyterian and Covenanter*, Pittsburg, Pa.; he edited *Lyman's Historical Chart* (Philadelphia, 1867), and has published several addresses, including *The Revised Bible* (Pittsburg, 1881). C. K. Hoyt.

Willson, Robert, D. D.: bishop; b. in Lincolnshire, England, in 1795; educated at the Roman Catholic Seminary at Oscott; was ordained priest 1825; was stationed several years at Nottingham; was appointed by Pope Gregory XVI. Bishop of Tasmania 1842; returned to England 1847, and communicated to the Government facts proving the barbarous treatment of convicts in Tasmania and on Norfolk island, which through his efforts was speedily remedied; returned to Tasmania 1848, resigned his bishopric from ill health 1865, and returned to England. D. at Nottingham, June 30, 1866. Revised by J. J. Keane.

Will's Point: town; Van Zandt co., Tex.; on the Tex. and Pac. Railway; 48 miles E. of Dallas (for location, see map of Texas, ref. 2–J). It is in an agricultural region; has 5 churches, a public and 2 private schools, 2 private banks, and a weekly newspaper; is an important shipping-point for cotton, cattle, and hides; and has several flour-mills and cotton-gins. Pop. (1880) 860; (1890) 1,025; (1900) 1,347. Editor of "Chronicle."

Willughby, Francis: naturalist; b. at Wollaton Hall, Nottinghamshire, England, in 1635; graduated at Cambridge about 1656; became a pupil of John Ray in natural history; resided some time at Oxford; traveled extensively on the Continent with Ray, making valuable collections for a work on natural history. D. July 3, 1672. He left many Latin MSS. upon natural history, which were translated, digested, and extended by Ray, who made them the basis of his own labors. (See Ray, John.) It is claimed that Willughby was the most accomplished zoölogist of his time, and that he was the author of the system of classification in zoölogy adopted by Linnæus. Revised by F. A. Lucas.

Wilmerding: town (founded in 1889); Allegheny co., Pa.; near the Monongahela river, and on the Penn. Railroad; 8 miles S. E. of Pittsburg (for location, see map of Pennsylvania, ref. 5–A). It was laid out for a manufacturing town by the Westinghouse Air-brake Company, and contains a foundry, machine-shops, and other works that employ over 3,000 men. The town site contains forty-two plots, comprising 740 lots, on which several hundred workmen have built homes. The supply of water is from the Monongahela river, near Port Perry; every street is sewered; natural gas is used for fuel; and the Westinghouse incandescent electric light is in general use. Wilmerding does its banking in Braddock. Pop. (1890) 419; (1900) 4,179.

Wilmington: city, port of entry, and capital of New Castle co., Del.; on the Delaware river at the junction of its affluents, the Christiana and Brandywine rivers, and on the Balt. and O., the Phila., Wil. and Balt., and the Phila. and Read. railways; 4 entering electric railways; 28 miles S. W. of Philadelphia, 70 miles N. E. of Baltimore (for location, see map of Delaware, ref. 2–H). There are four freight and passenger steamship lines to Philadelphia, connecting with the principal points on the Atlantic coast. The city is built mainly on elevated ground, and extends from the river front about 4 miles back, the most thickly settled part lying between the Christiana and the Brandywine rivers. The houses are principally of brick and Brandywine granite, and the streets are neatly paved, shaded well, lighted with gas and electricity, and traversed by electric cars. The city owns five parks (area 260 acres) and several squares. Among its public buildings are a new U. S. Government building, county court-house, city-hall, U. S. custom-house, 4 public libraries, auditorium, and Delaware Historical Association hall, the latter over 100 years old. The old Swedes' church, built of stone in 1698, is in excellent preservation, and is used by Trinity Episcopal society. There are 83 churches, divided denominationally as follows: Methodist Episcopal, 31; Baptist, 13; Roman Catholic, 10; Protestant Episcopal, 10; Friends, 2; Lutheran, 2; Presbyterian, 11; Reformed Episcopal, 2; Swedenborgian, 1; and Unitarian, 1. The educational institutions include 29 public and many parochial and private schools, 2 business colleges, and a Friends' School. The most prominent charitable and reformatory institutions are the Ferris Reform School for Boys, the girls industrial school, Home for Friendless Children, homes for aged men and women, and 3 hospitals. The Delaware State Hospital for the Insane is located at Farnhurst, 2 miles S., and the almshouse is near it. There are 2 savings-banks with aggregate deposits of $4,000,000, 2 trust companies with combined capital of $1,000,000, 6 national banks with combined capital and surplus of $1,500,000, 18 loan associations, and 6 daily, 8 weekly, 1 Sunday, 1 semi-monthly, and 3 monthly periodicals. The Brandywine within 4 miles from its mouth has a fall of 120 feet, and furnishes water-power for many factories, including 20 morocco-factories, 17 carriage-factories, 3 paper-mills, Du Pont's powder-mills, 4 ship-building yards, 4 car-building works, 27 iron-works, 4 cotton-factories, 3 hard-fiber works, glass-works, 4 marine railways, phosphate-factory, 2 flour-mills, 2 hosiery-factories, terra-cotta works, dental factory, surgical-instrument factory, wire-cable mill, chemical works, Pullman palace-car works, cigar factories, 1 silk-mill, 2 rolling-mills, car-wheel factory, patent-leather factory, 4 shirt factories, 2 shoe factories, 3 breweries, and a large steel plant. There are numerous brick-yards in the city.

The origin of the city was the building of Fort Christina by the Swedes in 1638. The Dutch captured this fort in 1655, and changed the name to Fort Altena, and the town under direction of Gov. Beekman became Christinaham. In 1731 the village of Willingtown, named after Thomas Willing, was begun. The name was afterward changed to Wilmington. The first borough election was held Sept. 8, 1740; the first town-hall was built in 1774; and a city charter was granted in 1832. Pop. (1880) 42,478; (1890) 61,431; (1900) 76,556. J. F. McIvor.

Wilmington: city (founded in 1847); Will co., Ill.; on the Kankakee river, and the Chi. and Alton Railroad; 15 miles S. by W. of Joliet; 53 miles S. W. of Chicago (for location, see map of Illinois, ref. 3–G). It is in an agricultural and coal-mining region, and has 5 churches, high school, 2 national banks (capital, $150,000), 2 weekly papers, good water-power, and several manufactories. Pop. (1880) 1,872; (1890) 1,576; (1900) 1,420. Editor of "Advocate."

Wilmington: city, port of entry, capital of New Hanover co., N. C.; on the Cape Fear river, and the Atlantic Coast Line, the Seabord Air Line, the Wil. Newb. and Norf., and the Wil. Sea Coast railways; 88 miles S. W. of Newbern, 214 miles N. E. of Charleston, S. C. (for location, see map of North Carolina, ref. 5–H). It is 26 miles above the mouth of the river and 8 miles from the Atlantic Ocean, and is on a peninsula between the river and the ocean. The city is built along the river front a distance of 2½ miles and extends back a mile. It is laid out in blocks of 2½ acres, with five lots to the block. The principal streets are 99 feet wide; the others 66 feet. The surface is an elevated sand ridge, fairly well drained. Among the noteworthy buildings are the city-hall, court-house, U. S. Government building, U. S. Marine Hospital, James Walker Memorial Hospital, Masonic Temple, Elks' Temple, the armory of the Wilmington Light Infantry, First Baptist church, Fifth Street Methodist Episcopal church, Grace church, St. John's Protestant Episcopal church, Y. M. C. A. building, and the public schools. The city has a chamber of commerce, merchants' association, and tariff association, a prod-

nce exchange, 3 hotels, 5 cemeteries, electric street-railways, water-works, electric lights. 3 national banks with combined capital of $325,000, 2 savings and trust companies with capital of $50,000, a private bank, and a monthly, semi-monthly, 3 daily, and 5 weekly periodicals.

There are 19 churches for white people and 14 for colored; aggregate value of church property, $500,000. The educational institutions include 3 public schools for white pupils and 3 for colored, with nearly 4,000 white pupils and nearly 4,500 colored; and 6 private and 4 parochial schools. There is also a library (founded in 1855), with over 5,000 volumes. A Bureau of Associated Charities, a United Charities (colored), and a Ladies' Benevolent Society look after the needy and unfortunate, and a County Home, a County House of Correction, a Seamen's Friend's Society, and the Catherine Kennedy Home for elderly women take charge of special cases. The city has a bonded debt (1901) of $600,000, and an assessed property valuation of $11,368,395. The principal business interests are the exportation of naval stores, cotton, lumber, and rice; truck-farming; and the manufacture of cotton goods, fertilizers, cottonseed oil, turpentine, spirits and oil from pine, saw and lumber mill products, and lampblack.

The city was settled in 1730–31 under the name of Newton; was incorporated under its present name in 1739; and was chartered as a city in 1866. The first newspaper was issued Sept. 1, 1764, and the first overt act of rebellion against British authority occurred in 1765, when the citizens refused to permit the landing of stamps brought in a man-of-war. On July 18, 1775, the militia under Col. John Ashe, who had led the anti-stamp party, captured Fort Johnson, at the mouth of the river, and forced the royal governor to flee. On the secession of North Carolina in 1861, Forts Johnson and Caswell were occupied by State troops. During the war many cargoes were run into Wilmington through the Federal blockading fleet, nearly 300 foreign steamships making the entrance safely with cargoes in the two years 1863–64. For the principal military operations in the vicinity of Wilmington during the war of 1861–65, see FORT FISHER. Pop. (1880) 17,350; (1890) 20,056; (1900) 20,976. WILLIAM H. BERNARD.

Wilmington: city; capital of Clinton co., O.; on the Balt. and O., and the Cin. and Musk. Valley railroads; 55 miles N. E. of Cincinnati, 60 miles S. W. of Columbus (for location, see map of Ohio, ref. 7–D). It is in an agricultural region, and contains 2 national banks with combined capital of $200,000, an incorporated bank with capital of $25,000, several mills, bridge-works, auger-bit works, gas and electric light plants, and 3 weekly newspapers. It is the seat of Wilmington College (Orthodox Friends, coeducational, organized 1870). Pop. (1890) 3,079; (1900) 3,613.

Wilmington: town (chartered in 1763); Windham co., Vt.; on the Deerfield river, and on the Hoosac Tunnel and Wilm. Railroad; 20 miles S. W. of Newfane, 96 miles S. W. of Montpelier (for location, see map of Vermont, ref. 10–B). It has Baptist, Congregational, Methodist Episcopal, and Universalist churches, public high school, 12 district schools, savings-bank, 4 hotels, several creameries, lumber-mills, maple-sugar works, and a weekly and 2 monthly periodicals. Pop. (1880) 1,130; (1890) 1,106; (1900) 1,221, village 410.

Wilmot, ALEXANDER: See the Appendix.

Wilmot, DAVID: jurist; b. at Bethany, Pa., Jan. 20, 1814; educated at the academies of Bethany and of Aurora (Cayuga co.), N. Y.; studied law, was admitted to the bar, and began practice at Wilkesbarre, Pa., 1834; soon removed to Towanda; sat in Congress as a Democrat 1845–51, and moved on Aug. 8, 1846, an amendment to a bill appropriating $2,000,000 for the purchase of Mexican territory, which became celebrated under the name "the Wilmot proviso"—"That, as an express and fundamental condition to the acquisition of any territory from the republic of Mexico by the U. S., . . . neither slavery nor involuntary servitude shall ever exist in any part of the said territory." This proviso was adopted by the House, but rejected by the Senate, and became the starting-point for the "Free-soil" movement of 1848. Mr. Wilmot was president judge of the Thirteenth District of Pennsylvania 1853–61, was a delegate to the Republican national conventions of 1856 and 1860, acting as the temporary chairman of the latter; an unsuccessful candidate for Governor of Pennsylvania 1857; was U. S. Senator to fill a vacancy 1861–63, and was appointed a judge of the U. S. court of claims by President Lincoln 1863. D. at Towanda, Pa., Mar. 16, 1868.

Wilmot, JOHN: See ROCHESTER, EARL OF.

Wilmot, ROBERT DUNCAN: statesman; b. in Fredericton, New Brunswick, Oct. 16, 1809; educated in St. John; engaged in business as a shipowner; represented St. John (city and county) in the New Brunswick Assembly 1846–61, 1865–67; was a member of the executive council of the province 1851–54, 1856–57, again in his own government in 1865, and from 1866 until 1867. He was surveyor-general of province 1851–54; provincial secretary 1856–57; mayor of St. John 1849; a delegate to the colonial conference in London 1866–67; and appointed in 1875 a commissioner on behalf of Canada to the Centennal Exposition at Philadelphia. He became a member of the Canadian Senate in Mar., 1865; a member of the privy council Nov. 8, 1878; was Speaker of the Senate from Nov. 8, 1878, to Feb. 1, 1880; and lieutenant-governor of New Brunswick from the latter date until Oct. 31, 1885. NEIL MACDONALD.

Wilmot Proviso: See WILMOT, DAVID.

Wilna: See VILNA.

Wilson: town; capital of Wilson co., N. C.; on the Atlantic Coast Line of railways; 44 miles E. of Raleigh, 108 miles N. of Wilmington (for location, see map of North Carolina, ref. 3–H). It is in a cotton and tobacco growing region; contains a collegiate seminary for young ladies, an academy, a graded school for colored pupils, a national bank, a State bank, improved water-works, and an electric-light plant; and has a semi-monthly and two weekly periodicals, several cotton-mills, large carriage-factory, plow-works, machine-shops, planing-mills, harness-factory, and a sash, door, and blind factory. Over 5,000,000 lb. of tobacco are handled here annually. Pop. (1890) 2,126; (1900) 3,525.

Wilson, ALEXANDER: ornithologist; b. at Paisley, Scotland, July 6, 1766; was trained as a weaver; engaged in peddling; published a volume of poems in 1790 (2d ed. 1791); was sentenced in 1793 for a lampoon, after which event he emigrated, and landed at New Castle, Del., July 14, 1794. He worked for some time as a weaver, and then as a peddler; taught school in various places—in 1802 at Kingsessing on the Schuylkill—and was afterward employed in Philadelphia as editor of the American edition of Rees's *Cyclopædia*. During his wanderings as a peddler he always took a great interest in observing the life of birds; and this interest was further developed during his residence at Kingsessing by his acquaintance with William Bartram. He determined to write an American ornithology. At his death, in Philadelphia, Aug. 23, 1813, seven volumes of this work had been published; the eighth and ninth were edited after his death by George Ord, and a continuation was given by Charles Lucien Bonaparte (Philadelphia, 4 vols., 1825–33). His poems were published at Paisley in 1816, and at Belfast in 1857, and his statue was raised at Paisley in 1874. See C. Lucy Brightwell, *Difficulties Overcome, Scenes in the Life of Alexander Wilson, the Ornithologist* (London, 1860); Allan Park Paton, *Alexander Wilson the Ornithologist, a New Chapter of his Life* (1863); and a volume of verse, sketches, notes, etc., published by A. B. Grosart, Paisley, 1874.

Wilson, ALLEN B.: inventor in 1849 of the first sewing-machine by which an endless seam could be sewed capable of being turned upon any curve or at any angle at the pleasure of the operator while the seam was being formed. He was born in Willett, N. Y., Oct. 18, 1824, and learned the trade of a cabinet-maker. In 1850 he also invented the rotary hook and stationary bobbin of the Wheeler & Wilson sewing-machine, by which was obtained a double-thread machine of the greatest speed, with the least expenditure of power and waste of thread, with the smallest wear of parts, adapted to a range of practical articles and fabrics from the lightest want of a family to the heaviest necessity of stitch manufacture. D. Apr. 29, 1888. See the article SEWING-MACHINES.

Wilson, Sir ARCHDALE: soldier; b. at Didlington, Norfolk, England, in 1803; entered the military service of the East India Company 1819 as an officer of artillery; was distinguished at the siege of Bhurtpore 1825–26; participated in the Sikh war 1848–49; became colonel 1854; was brigadier-general of artillery at Meerut at the outbreak of the Sepoy rebellion May, 1857; was the first British officer to encounter the mutineers in the field, defeating them May 30–31; effected a junction with the Delhi field force under Sir Henry Barnard; succeeded to the command of that force on the death of Barnard in July; maintained his position

before Delhi until Sept. 14, when the city was stormed and taken after six days' hard fighting in the streets, for which service he was made a baronet; received the thanks of both houses of Parliament and a pension of £1,000 from the East India Company; was promoted major-general Sept., 1857, and lieutenant-governor Mar., 1858, and took part as commander of the Royal Horse Artillery in the siege and capture of Lucknow, 1858, for which he was again thanked by Parliament. D. in London, May 9, 1874.

Wilson, AUGUSTA (*Evans*): See EVANS.

Wilson, Sir CHARLES RIVERS: financier; b. in London, Feb. 19, 1831; was educated at Eton and at Baliol College, Oxford; was appointed clerk in the Treasury in 1856; was a private secretary of Mr. Disraeli 1867–68, and of Mr. Lowe 1868–73, when they held the position of Chancellor of the Exchequer; and he became controller of the National Debt Office in 1873. In 1876 he was appointed one of the British administrators of the Suez Canal, and in 1878 was appointed vice-president of the international commission of inquiry into the financial condition of Egypt. On the presentation of their report he was made finance minister to the khedive, and in 1880 was appointed by the new khedive, Tewfik Pasha, president of the international commission of liquidation. In 1881 and 1885 he took part in international negotiations in Paris; in 1892 was one of the delegates at the monetary conference in Brussels; and in 1895 he became president of the Grand Trunk Railway of Canada. In 1880 he received the Turkish order of the Medjidieh, and was made a G. C. M. G. in 1895.

Wilson, Sir DANIEL, LL. D., F. R. S. E.: educator and author; b. in Edinburgh, Scotland, Jan. 5, 1816; educated at Edinburgh University, and engaged in literary pursuits. He was appointed Professor of History and English Literature in University College, Toronto, in 1853; became president of that institution in 1881; was elected president of the Canadian Institute in 1860; president of the Royal Society of Canada in 1885, and was knighted in 1888. He published the following works: *Memorials of Edinburgh in Olden Times* (1847); *The Archæology and Prehistoric Annals of Scotland* (1851); *Prehistoric Man: Researches into the Origin of Civilization in the Otd and the New Wortd* (1862); *Chatterton, a Biographical Study* (1869); *Caliban, or the Missing Link* (1873); *Spring Witd Ftowers* (1875); *Reminiscences of Old Edinburgh* (1878); *Anthropology* (1885); and *Wittiam Nelson, a Memorial* (1890). D. in Toronto, Aug. 7, 1892. NEIL MACDONALD.

Wilson, FLORENCE, known only by the Latinized form of his name as FLORENTIUS VOLUSENUS: scholar and theologian: b. near Elgin, Morayshire, Scotland, about 1500; educated at the Universities of Aberdeen and Paris; became a member of the households of Cardinals Du Bellay and Sadolet, master of the Latin and Greek school at Carpentras; author of *Commentatio quædam Theotogica quæ eadem Precatio est in Aphorismos dissecta* (Lyons, 1539); *De Animi Tranquitlitate* (1543; several times reprinted at Edinburgh, the best edition being that of Thomas Ruddiman, 1707); and *Poemata* (London, 1619). D. at Vienna in 1547. His death was commemorated by George Buchanan in sonorous Latin verses, and a *Life* was written by Dr. Lettice. Revised by J. J. KEANE.

Wilson, HENRY: statesman; b. at Farmington, N. H., Feb. 16, 1812; was apprenticed at the age of ten to a neighboring farmer, remaining in his service for eleven years, after which he took up his residence in Natick, Mass. In 1836 he visited Washington, where his first sight of slavery and the domestic slave-trade produced an impression so profound on his mind that he made a solemn resolve to devote his life to the cause of emancipation. In 1840 he was elected a member of the lower branch of the State Legislature: in 1844 and 1845 he was a member of the State Senate; in 1848 was a member of the national convention of the Whig party. In this body, on the nomination of Gen. Taylor on a platform unpledged against slavery extension, he openly renounced his connection with the Whig party, and gave his support to the Free-Soil organization. In 1850 he was again elected to the State Senate, and was made president of that body. He failed of an election as Governor of the State in 1853, but two years afterward he was chosen a Senator of the U. S. in the place of Edward Everett, resigned. During the civil war his name is associated with much important legislation, and he did especially good work as chairman of the committee on military affairs. In 1872 he was elected Vice-President of the U. S. In the last years of his life he prepared his great literary work, *The Rise and Fall of the Slave Power*, two volumes of which were published before his death, the third and last being left nearly completed in manuscript. He died in Washington, Nov. 22, 1875.

Wilson, HENRY BRISTOW: clergyman and educator; b. in London, England, in 1803; educated at Merchant Taylors' School, of which his father, Rev. Harry B. Wilson, D. D. (1774–1853), was a master and the historian; studied at St. John's College, Oxford; graduated with high classical honors 1825; became a fellow and tutor at St. John's; took orders in the Church of England; was one of the four resident tutors at Oxford who in 1841 issued a joint protest and remonstrance to the editor of *Tracts for the Times* on account of their Romanizing interpretation of the XXXIX. Articles; was successively a select preacher, public examiner, Professor of Anglo-Saxon, and Bampton lecturer (1850) at Oxford; became vicar of Great Staughton, Huntingdonshire, 1851, and was one of the seven clergymen of the Church of England who in 1860 published the famous volume of *Essays and Reviews*, to which his contribution was an essay on *The National Church*; was tried for heresy before the court of arches, and sentenced to a year's suspension from his benefice 1862, but obtained a reversal on appeal to the privy council; was author of *The Communion of Saints, an Attempt to Illustrate the Principles of Church Union* (1851, the Bampton lecture); contributed to *Oxford Essays*, and published sermons and pamphlets on university and theological questions. D. at Lee, Kent, Aug. 10, 1888. Revised by S. M. JACKSON.

Wilson, HORACE HAYMAN, F. R. S.: Orientalist; b. in London, England, Sept. 26, 1786; studied medicine; went to India in 1808 as assistant surgeon in the Bengal service of the East India Company; gave his attention to chemistry; obtained an appointment in the Calcutta mint as assistant to Dr. Leyden, the noted Orientalist; became assay-master and secretary; applied himself with great diligence to the study of Sanskrit literature; was appointed secretary of the Asiatic Society of Bengal on the death of Dr. William Hunter 1811; became secretary to the public instruction committee at Calcutta, and director of studies of the Hindu college at Benares 1819; returned to England in 1832 as Boden Professor of Sanskrit at Oxford University; was appointed librarian at the East India House on the death of Sir Charles Wilkins 1836, and retained both offices until his death, in London, May 8, 1860. Among his numerous works were a *Sanskrit and Engtish Dictionary* (Calcutta, 1819; 2d ed., enlarged, London, 1832); a *Sanskrit Grammar* (1841; 2d ed. Oxford, 1847); *A History of British India from 1805 to 1835* (3 vols., 1844–48); *Ariana Antiqua, a Descriptive Account of the Antiquities and Coins of Afghanistan* (1841); *A Sketch of the Religious Sects of the Hindus* (Calcutta, 1846); *A Glossary of Judicial and Revenue Terms, etc., in Arabic, Persian, Hindustani, Sanskrit, Bengali, Uriya, Marthi, Guzurathi, Telugu, Karnata, Tamit, Malayatam, and other Languages* (1855); and many translations in verse or prose of classical works from the Sanskrit, including *The Megha-Dūta*, or *Cloud Messenger* (1813; new ed., with vocabulary, 1869); *Select Specimens of the Theatre of the Hindus* (Calcutta, 3 vols., 1827; 2d ed., 2 vols., 1835); the *Vishnu Purāna* (1840; new ed., 6 vols., 1867–70); and *The Rig-Veda Sanhita* (3 vols., 1850–57), comprising about one-half of the hymns of that collection. His collected works were published under the editorship of Rost and Fitzedward Hall (13 vols., 1861–67).

Wilson, JAMES: signer of the Declaration of Independence; b. near St. Andrews, Scotland, in 1742; educated at the Universities of Glasgow, St. Andrews, and Edinburgh; emigrated to Pennsylvania 1766; was a tutor in the College and Academy of Philadelphia; studied law; was admitted to the bar 1768; practiced at Reading, Carlisle, and Annapolis, Md.; was a member of the Pennsylvania provincial convention 1774, and of the Continental Congress 1775–77, and again 1782–83 and 1785–87; signed the Declaration of Independence, and wrote several pamphlets on political questions; was commissioned a colonel at the outbreak of the Revolutionary war, but did not serve in the field; settled at Philadelphia 1778; was advocate-general for the French Government in the U. S. 1779–83; was a member of the committee which drafted the Federal Constitution 1787, of the Pennsylvania convention which ratified it, and of the convention which amended the State constitution of Penn-

sylvania in 1790; was appointed in Sept., 1789, one of the first judges of the U. S. Supreme Court, and became in 1790 the first Professor of Law in the College of Philadelphia. He published *Address to the Citizens of Philadelphia* (1784). D. at Edenton, N. C., Aug. 28, 1798. His *Works* (3 vols., 1803–04), consisting chiefly of legal lectures, speeches, and orations, were edited by his son, Bird Wilson.

Wilson, James: naturalist; brother of Prof. John Wilson (1785–1854); b. at Paisley, Scotland, in 1795; studied but never practiced law; traveled on the Continent in 1816, 1819, and 1820–21; settled at Woodville, near Edinburgh, 1824, and died there May 18, 1856. He was the author of *Illustrations of Zoölogy* (9 parts, 1826–32); *A Treatise on Insects* (1835); *The Natural History of Quadrupeds and Whales* (1838); *The Natural History of Fishes* (1838); *The Natural History of Birds* (1839); *A Voyage round the Coasts of Scotland and the Isles* (2 vols., 1842); and *Illustrations of Scripture, by an Animal Painter*; aided Hugh Murray in his works on Africa, North America, and India, and Patrick Fraser Tytler in his *Progress of Discovery on the Northern Coasts of America* (1832); was joint author with James Duncan of *Entomologia Edinensis* (1834); contributed largely to *Blackwood* and the quarterly reviews, and wrote the articles on natural history in the 7th and 8th eds. of the *Encyclopædia Britannica*. His *Memoirs* (1859) were written by James Hamilton, D. D. Revised by F. A. Lucas.

Wilson, Sir James Erasmus, F. R. S.: dermatologist; b. at Aberdeen, Scotland, Apr. 28, 1809; studied medicine; became lecturer on anatomy and physiology at the Middlesex Hospital Medical School, consulting surgeon to St. John's Hospital, London; a fellow by election of the Royal College of Surgeons 1843; a member of its council 1870, and its president in 1881; gave special attention to diseases of the skin, in which branch he was the leading English authority; founded in 1869 in the College of Surgeons a museum and a professorship of dermatology, and was chosen the first occupant of that chair. He was the author of *Practical and Surgical Anatomy* (1838); *The Anatomist's Vade Mecum, a System of Human Anatomy* (1842); *Diseases of the Skin* (1842); *Healthy Skin* (1845); *History of the Middlesex Hospital* (1845); *Ringworm, its Causes, Pathology, and Treatment* (1847); *On Syphilis, Constitutional and Hereditary* (1852); *The Eastern or Turkish Bath* (1861); *On Food as a Means of Prevention of Disease* (1865); and edited the *Quarterly Journal of Cutaneous Medicine*. He spent large sums of money in charity, and for his benefactions was knighted in 1881. Most of his works have been reprinted, and have had a large circulation in the U. S. D. at Westgate-on-the-Sea, Aug. 7, 1884. Revised by S. T. Armstrong.

Wilson, James F.: U. S. Senator; b. at Newark, O., Oct. 19, 1828; received a good education, and studied law; settled at Fairfield, Ia., 1853; was elected to the convention for revising the State constitution 1856; sat in both houses of the Legislature; became a member of the State Senate 1859; was president of that body 1861; was a member of Congress 1861–69, serving as chairman of the judiciary committee and as one of the managers of the impeachment of President Johnson, and in 1869 was appointed a commissioner for the Pacific Railroad; was elected U. S. Senator (Iowa) for 1883–89; re-elected for 1889–95. D. at Fairfield, Ia., Apr. 22, 1895.

Wilson, James Grant, D. C. L., LL. D.: author; b. in Edinburgh, Scotland, Apr. 28, 1832; was taken to the U. S. in infancy by his father, William Wilson, poet (1801–60); served through the civil war in the southwest under Gens. Grant and Banks, attaining the rank of brigadier-general. Prior to 1861 he had been engaged in the publishing business with his father in Poughkeepsie, N. Y.; settled in New York city at the close of the war. Since 1884 he has been president of the New York Genealogical and Biographical Society, and for three years also president of the American Authors' Guild, of which he was one of the founders. Gen. Wilson was instrumental in erecting the statues of Fitz-Greene Halleck (1877) and Columbus (1894) in the Central Park. Author or editor of *Illinois Officers in the Rebellion* (1863); *Life of Gen. Grant* (1868; 3d ed. 1885); *Mr. Secretary Pepys and his Diary* (1869); *Life and Letters of Fitz-Greene Halleck* (1869); *Sketches of Illustrious Soldiers* (1874); *Poets and Poetry of Scotland, from the Earliest to the Present Time* (2 vols., London and New York, 1876); *Centennial History of the Diocese of New York, 1785–1885* (1886); *Bryant and his Friends; Reminiscences of the Knickerbocker Writers* (1886); Appletons' *Cyclopædia of American Biography* (6 vols., 1886–89); *Personal Recollections of the Rebellion* (1891); *The World's Largest Libraries* (New York, 1894); *Memorial History of the City of New York* (4 vols., 1892–93); and Great Commanders' Series (16 vols., 1892–96).

Wilson, James Harrison: soldier; b. near Shawneetown, Ill., Sept. 2, 1837; educated at McKendree College and at West Point, where he graduated 1860; became first lieutenant of topographical engineers Sept. 9, 1861, and captain May 7, 1863; served in the Port Royal expedition and at the capture of Fort Pulaski, Ga., for which he was breveted major Apr. 11, 1862; was aide-de-camp to Gen. McClellan at South Mountain and Antietam; became staff lieutenant-colonel of volunteers Nov. 8, 1862; was assistant engineer and inspector-general of the Army of the Tennessee in the campaign against Vicksburg, and in the operations about Chattanooga and Knoxville; was made brigadier-general of volunteers Oct. 31; breveted lieutenant-colonel U. S. army Nov. 24, 1863, for gallantry at Chattanooga; commanded the 3d cavalry division of the army of the Potomac May to Aug., 1864; was breveted colonel May 5 for the battle of the Wilderness; took part in the ensuing battles of that campaign up to and during the siege of Petersburg, and in the Shenandoah valley Aug. and Sept., 1864; commanded the cavalry of the division of the Mississippi from Oct., 1864, to July, 1865; took part in Gen. Thomas's campaign in Tennessee, distinguishing himself at the battles of Franklin and Nashville, and in a cavalry raid into Alabama and Georgia Mar. and Apr., 1865; was breveted brigadier and major-general U. S. army Mar. 13, 1865, for the battle of Nashville and the capture of Selma, Ala., respectively; took Montgomery, Columbus, and Macon; was made major-general of volunteers Apr. 20, 1865; captured Jefferson Davis May 10, 1865; mustered out of volunteer service July 8, 1866; became lieutenant-colonel of Thirty-fifth Infantry July 28, 1866; resigned Dec. 31, 1870; vice-president St. Louis and Southeastern (now Louisville and Nashville) Railroad 1870–76; U. S. civil engineer on improvement of Illinois river, etc., 1871–76; and vice-president N. Y. and N. E. Railroad 1878–80, and its president 1880–83. He is the author of *Life of Gen. U. S. Grant* (1868); *Life of Andrew J. Alexander* (1887); *China: Travels and Investigations in the Middle Kingdom* (1887; new ed. 1901), besides numerous scientific and literary articles. Revised by James Mercur.

Wilson, John: clergyman; b. at Windsor, England, in 1588; educated at Eton School 1598–1602; entered King's College, Cambridge, 1602; graduated about 1606; obtained a fellowship; studied law three years at one of the inns of court; took orders in the Church of England; became conspicuous for his Puritanical leanings; took part in the project of the colonization of Massachusetts; emigrated with Winthrop's colony 1630; landed at Salem June 12; removed soon afterward to Charlestown, where he preached under a tree, and instituted (July 30) what was afterward the first church of Boston, consisting of himself, Gov. Winthrop, Isaac Johnson, and Deputy-Gov. Thomas Dudley; was ordained "teacher" of that church Aug. 27 by imposition of hands of the members thereof; was ordained pastor of the church Nov. 22, 1632; visited England in 1631 and again in 1634, returning with his wife Oct. 3, 1635, along with the celebrated Hugh Peters; took a prominent part in the Antinomian controversy as the chief ally of Gov. Winthrop against the party headed by Wheelwright and Mrs. Hutchinson; was chaplain to the Massachusetts forces sent to Connecticut against the Pequots 1636, for which service he afterward received a grant of 1,000 acres of land in the present town of Quincy; accompanied the "apostle" John Eliot on his visit to the Indian settlements, and labored for their interests; was noted for benevolence, hospitality, and readiness in improvising verses, being esteemed by Cotton Mather "the greatest anagrammatist since the days of Adam." D. at Boston, Aug. 7, 1667. Biographies were written by Mather in his *Magnalia* (1702) and by Rev. Dr. A. W. McClure in the *Lives of the Chief Fathers of New England* (6 vols., 1746, *seq.*). He published in England a theological treatise, *Some Helps to Faith* (1625); a poem, *Famous Deliverances of the English Nation* (1626; new ed. Boston, 1680); a Latin poem to the memory of John Harvard; and a tract, *The Day Breaking, if not the Sun Rising, of the Gospel with the Indians in New England* (1647; new ed. New York, 1865), besides many other occasional productions.

Wilson, John, more generally known by his pseudonym Christopher North: author and educator; b. at Paisley, Scotland, May 18, 1785; son of a wealthy manufacturer; studied at the University of Glasgow and at Magdalen College, Oxford, where he won the Newdigate prize for English poetry by a poem on *The Study of Greek and Roman Architecture*, and graduated in 1807. In 1808 he bought the estate of Elleray, on Lake Windermere, in Westmoreland, where he lived in intimate intercourse with Wordsworth, Coleridge, and Southey, and published in 1812 the poem *The Isle of Palms*. In 1815 he sold Elleray, removed to Edinburgh, and was admitted to the bar; published in 1816 the dramatic poem, *The City of the Plague*; became one of the chief contributors to *Blackwood's Magazine*, founded in 1817; and was appointed Professor of Morals in 1820 at the University of Edinburgh, in preference to Sir William Hamilton. In 1822 he published *Lights and Shadows of Scottish Life*; in 1823, *The Trials of Margaret Lindsay*; in 1825, *The Foresters*; in 1841, *Essay on the Genius and Character of Burns*; but his most popular productions were his contributions to *Blackwood's Magazine* under the pseudonym of "Christopher North": *Noctes Ambrosianæ*, imaginary dialogues, at Ambrose's tavern in Edinburgh, between the leading contributors to *Blackwood* (1822–35); *Dies Boreales, or Christopher under Canvas* (1849–52), etc. In 1851 he resigned his chair at the university. D. in Edinburgh, Apr. 3, 1854. A collected edition of his works was published in 12 vols. by his son-in-law, Prof. Ferrier; his *Life* was written by his daughter, Mrs. Gordon (2 vols., 1862); and a bronze statue of him has been raised in Edinburgh. Revised by H. A. Beers.

Wilson, John, D. D.: missionary; b. near Lauder, Scotland, Dec. 11, 1804; educated in Edinburgh, and from 1828 till his death there Dec. 1, 1875, missionary at Bombay, after 1843 in the Free Church. He was one of the most learned and influential of missionaries. Author of *An Exposure of the Hindu Religion* (Bombay, 1832); *A Second Exposure* (1834); *The Doctrine of Jehovah, addressed to the Parsis* (1839; 3d ed. Edinburgh, 1847); *The Parsi Religion* (1843); *The Lands of the Bible Visited and Described* (2 vols., Edinburgh, 1847); *The Evangelization of India* (1849); and *The History of the Suppression of Infanticide in Western India* (Bombay, 1855). See his *Life*, by George Smith (London, 1878).—His son, Andrew, b. in Bombay, 1831, was employed by the East India Company; visited China; traveled in Western Tibet; was author of *The Ever-Victorious Army*, a narrative of the suppression of the Tai-ping rebellion in China (Edinburgh, 1878), and of *The Abode of Snow* (1885; 2d ed. 1876), an account of his travels in the Himalayas. D. June 8, 1881. Revised by S. M. Jackson.

Wilson, John Leighton, D. D.: missionary; b. on a plantation at Salem, Sumter co., S. C., Mar. 25, 1809; educated at Union College, Schenectady, N. Y., 1829, and at the Presbyterian Theological Seminary, Columbia, S. C., 1833; sailed for Africa as missionary of the American board at Cape Palmas, West Africa, 1834; in 1842 he was transferred to the Gaboon, where he started a mission. In both places he reduced the language to writing, and prepared grammars and dictionaries, set up printing-presses, and taught the natives to read. He also paid attention to natural history, and is said to have discovered and named the gorilla in 1846. In 1852 he returned home; was a secretary of the Presbyterian board of foreign missions from 1853 to 1861. On the outbreak of the civil war he left for the South, and entered at once into the service of the Southern Presbyterian Church, and combined the functions of secretary of both home and foreign missions until 1872, and he held the latter office till his death at Salem, S. C., July 13, 1886. He was the author of *Western Africa: its History, Condition, and Prospects* (New York, 1857). See his *Life*, by H. C. Du Bose (Richmond, Va., 1895).

Samuel Macauley Jackson.

Wilson, John Mackay: author; b. at Tweedmouth, Scotland, in 1804; was for some years editor of the Berwick *Advertiser*. He was the editor and principal author of an important work, of which 150,000 copies have been sold—*Tales of the Borders, Historical, Traditionary, and Imaginative* (6 vols., 1835–40), intended as a companion to the *Waverley Novels*. The last edition, revised and enlarged by Alexander Leighton, appeared in 24 vols. (Edinburgh, 1869). D. at Berwick-on-Tweed, Oct. 2, 1835.

Wilson, Sir Robert Thomas: soldier; b. in Bloomsbury, London, England, in 1777; educated at Westminster and Winchester schools; took part as a volunteer in the campaign in Flanders 1793–94; was on the staff in Ireland during the rebellion of 1798; served in Holland 1799, in Egypt under Abercromby 1800; accompanied Sir D. Baird to Brazil and the Cape of Good Hope 1805; went with Lord Hutchinson on a secret mission to the allied armies on the Russian frontier 1806–07; served in Portugal and Spain 1808–10, in command of the Lusitanian Legion, and afterward of a Spanish brigade; was British military commissioner at the Russian headquarters in 1812, and at the camp of the allies in the subsequent campaigns in Germany and France; received decorations from the allied emperors; aided in effecting the escape of Count Lavalette at Paris, Jan., 1815; incurred the displeasure of the prince regent by espousing the cause of Queen Caroline; was in consequence dismissed from the army 1821, but was indemnified by a public subscription, and a few years later was restored to his rank; sat in Parliament as a Liberal 1818–31; attained the full rank of general 1841, and was governor of Gibraltar 1842–49. D. in London, May 9, 1849. He was the author of *A History of the British Expedition to Egypt* (1802), etc. Since his death have appeared his *Narrative of Events during the Invasion of Russia by Napoleon Bonaparte and the Retreat of the French Army* (1860), and his *Private Diary of Travels, Personal Services, and Public Events during Missions and Employment with the European Armies in the Campaigns of 1812–13–14, from the Invasion of Russia to the Capture of Paris* (2 vols., 1861, both edited by his nephew and son-in-law, Rev. Herbert Randolph, who also published a *Life* (2 vols., 1863).

Wilson, Sir Roland K.: See the Appendix.

Wilson, Theodore Delavan: naval constructor; b. in Brooklyn, N. Y., May 11, 1840; served apprenticeship as shipwright at the navy-yard, Brooklyn; appointed a carpenter in the navy 1861; served about two years afloat; was in the fight with the Merrimack in Hampton Roads; ordered to duty as an inspector of the building and repairing of vessels in private establishments in New York and vicinity in 1863; appointed an assistant naval constructor May 17, 1866; served in the navy-yards at Pensacola, Philadelphia, and Washington; was four years instructor in naval architecture and ship-building at the U. S. Naval Academy; promoted to be naval constructor July 1, 1873; appointed member of the first naval advisory board to report upon the number and classes of vessels that should be constructed for the naval service (1881); chief constructor of the navy 1882; resigned in 1893. D. June 29, 1896. He was an honorary member of the Institute of Naval Architects of England, and first vice-president of the U. S. Society of Naval Architects and Marine Engineers. He was the author of *Ship-building, Theoretical and Practical* (New York, 1873), used as a text-book at the Naval Academy.

Wilson, Sir Thomas: scholar; b. at Stroby, Lincolnshire, England, about 1524; educated at Eton under the celebrated Udal; was sent on an Eton scholarship to King's College, Cambridge, where he graduated in 1546; took orders in the Church of England; became tutor to Henry and Charles Brandon, sons of the Duke of Suffolk by Mary, the ex-Queen of France, both of whom, however, soon died; wrote the biographies of his pupils in a rare Latin volume, *Vita et obitus duorum fratrum Suffolciensium Henrici et Caroli Brandoni* (London, 1551); published *The Rule of Reason, conteining the Arte of Logique set forth in Englishe* (1551; 9th ed. 1580); and *The Arte of Rhetorique* (1553; 9th ed. 1585), said to be the first critical treatises on logic and rhetoric in English, and incidentally to give the author a title to rank as the founder of English philology, the latter work having been referred to by Shakespeare, and having exerted a powerful influence to purify the English language from foreign idioms. He withdrew to the Continent on the accession of Mary 1553; took the degree of LL. D. at the University of Ferrara; was imprisoned by the Inquisition at Rome on charges said to have been based on his published works; was put to the torture; obtained his liberty at the death of Pope Paul IV. 1555, when the populace broke open the prison of the Inquisition; returned to England soon after the accession of Elizabeth, to whom he became private secretary 1558, acting also as her instructor in various branches of learning; was made master of requests and master of St. Catherine's Hospital, near the Tower; published a translation of *The Three Orations of Demosthenes, Chief Orator among the Grecians, in Favor of the Olynthians, with those his fower Orations against King*

Philip of Macedonie (1570; 2d ed. 1572), which greatly pleased Queen Elizabeth by the obvious analogies it suggested between Philip of Macedon and Philip II. of Spain; issued *A Discourse upon Usurie by way of Dialogue and Oracions* (1572; 3d ed. 1584); went as ambassador to the Netherlands 1576; succeeded Sir Thomas Smith as Secretary of State and colleague of Sir Francis Walsingham 1577, and became dean of Durham 1579. D. in London, June 16, 1581. See Strype's *Annals*. Revised by S. M. JACKSON.

Wilson, THOMAS, D. D., LL. D.: bishop; b. at Burton, Cheshire, England, Sept. 20, 1663; educated at Trinity College, Dublin; took orders in the Church of England; became curate of Newchurch Kenyon, Lancashire, 1686; domestic chaplain to the Earl of Derby 1692; traveled on the Continent with that nobleman's son, Lord Strange, 1694–97; and was Bishop of Sodor and Man fifty-seven years, from Jan. 16, 1698, until his death on the island, Mar. 7, 1755. He was "held in the most exalted reputation for apostolic piety and unquenchable zeal in good works," and is even yet prominent in the writings of Matthew Arnold, Ruskin, and their followers as an exemplar of their doctrine of "sweetness and light." He was the author of *The Principles and Duties of Christianity* (1699), in English and Manx (being the first book printed in the language of the Isle of Man); *A short and plain Instruction for the better understanding of the Lord's Supper* (1736; very many later editions); *The Knowledge and Practice of Christianity made easy to the Meanest Capacities, or an Essay toward an Instruction for the Indians* (1740; 20th ed. 1848); *Sacra Privata* (1800; very numerous later editions); several volumes of *Sermons* and other treatises. His *Works* (Bath, 2 vols., 1781) were edited with a *Life* by Rev. C. Crutwell, and again with *Life* by John Keble (7 vols., Oxford, 1847–63). Revised by S. M. JACKSON.

Wilson, WILLIAM: poet; b. in Perthshire, Scotland, Dec. 25, 1801; was editor of the Dundee *Review* (1821–23) and of the *Literary Olio* (1824), for which he wrote many poems; resided afterward in Edinburgh as a writer for the press; was intimate with the brothers Chambers; removed to the U. S. 1833; established himself as a bookseller and publisher at Poughkeepsie, N. Y., 1834; wrote under the signatures of Allan Grant and Alpin for *Blackwood's Magazine*, *Chambers's Journal*, the *Knickerbocker*, the *Albion*, and other Scottish and American periodicals; associated with him his son, James Grant Wilson, in 1856, the firm having previously been Potter and Wilson; edited the *Scottish Songs, Ballads, and Poems* of Hew Ainslie (New York, 1855), and several other volumes. D. in Poughkeepsie, Aug. 25, 1860. A volume of his *Poems* was edited by Benson J. Lossing (1870; revised and enlarged editions 1875, 1884).

Wilson, WILLIAM DEXTER, D. D., LL. D., L. H. D.: clergyman and educator; b. at Stoddard, N. H., Feb. 28, 1816; educated at the Walpole (N. H.) Academy and Harvard University; in 1842 was ordained in the Protestant Episcopal Church; in 1850 became Professor of History and Moral and Intellectual Philosophy in Geneva College (now Hobart), and became Professor of Intellectual and Moral Philosophy in Cornell University at its opening. In 1886 he was retired as emeritus professor and became deacon of St. Andrew's Divinity School, Syracuse, N. Y. His principal works are *Lectures on Psychology, Comparative and Human* (1871); *Introduction to the Study of Metaphysics and Intellectual Philosophy* (1872); *Live Questions in Psychology and Metaphysics* (1877); and *The Foundations of Religious Belief* (1883). J. M. B.

Wilson, WILLIAM LYNE: lawyer; b. at Middleway, Jefferson co., W. Va., May 3, 1843; graduated at Columbian College (now University), Washington, in 1860; entered the University of Virginia in 1861, which he left to join the Confederate army; became Professor of Ancient Languages at Columbian College and began studying law at the close of the war; was also Professor of Latin Language and Literature in 1867–71, and studied political economy and politics; and resigned to practice law. In 1882 he was president of the State Senate; was elected to Congress in the same year; and in the latter body he served continuously till 1894, when he was defeated by his Republican opponent. As chairman of the committee on ways and means he prepared the Tariff Bill of 1894, which bore his name, and he vigorously supported it in the House, but did not approve of the Senate amendments. In Apr., 1895, he was appointed Postmaster-General. In 1897 he became president of Washington and Lee University. D. Oct. 17, 1900.

Wilson, WOODROW, Ph. D., LL. D.: educator and author; b. at Staunton, Va., Dec. 28, 1856; was educated at Davidson College, North Carolina, 1873–74, and Princeton College 1875–79; studied law in the University of Virginia 1879–81; history and politics in Johns Hopkins University 1883–86; held successively various college appointments; since 1890 has been Professor of Jurisprudence in Princeton College; and since 1887 lecturer on administration in Johns Hopkins University. On literary and political topics Dr. Wilson is a public lecturer and a contributor to magazines and reviews; he has published *Congressional Government: a Study in American Politics* (Boston, 1885), which has gone through many editions and is widely known and used by foreign publicists; *The State: Elements of Historical and Practical Politics* (Boston, 1889); *Division and Reunion, 1829–1889*, in *Epochs of American History* (New York and London, 1893); and *An Old Master and other Political Essays* (New York, 1894). C. K. HOYT.

Wilton: town (incorporated in 1802); Fairfield co., Conn.; on the Norwalk river, and the N. Y., N. H. and Hart. Railroad; 6 miles N. of Norwalk, 16 miles S. of Danbury (for location, see map of Connecticut, ref. 12–D). It was set off from the town of Norwalk; contains the villages of Wilton, North Wilton, South Wilton, Cannon, and Georgetown; has two academies and a boarding-school; and is principally engaged in agriculture and wire-drawing. In 1894 it had a grand list of $653,264. Pop. (1880) 1,864; (1890) 1,722; (1900) 1,598.

Wilton: town; Muscatine co., Ia.; on the Chi., Rock Id. and Pac. Railway; 12 miles N. of Muscatine, the county-seat, 25 miles W. of Davenport (for location, see map of Iowa, ref. 6–K). It is in an agricultural and stock-raising region, and has 8 churches, the Wilton German-English College, several public schools, excellent artesian water system, and 3 weekly newspapers. Pop. (1880) 1,431; (1890) 1,212; (1900) 1,233. EDITOR OF "REVIEW."

Wilton: town (settled in 1789, incorporated in 1803); Franklin co., Me.; on the Maine Cent. Railroad; 8 miles S. W. of Farmington, the county-seat (for location, see map of Maine, ref. 8–B). It contains the villages of Wilton and East Wilton, and has six churches, Wilton Academy, and manufactories of carriages, cabinet-work, coffins and caskets, woolen goods, shingles, long and short lumber, and bobbins. Pop. (1880) 1,739; (1890) 1,622; (1900) 1,647.

Wilton: town; Hillsboro co., N. H.; on the Souhegan river, and the Boston and Maine Railroad; 15 miles W. of Nashua, 41 miles S. W. of Concord (for location, see map of New Hampshire, ref. 9–E). It contains the villages of Wilton and West Wilton, four churches, a savings-bank, several lumber-mills, woolen-mill, creameries, and plow, wooden-ware, carriage, and trunk factories. Pop. (1880) 1,747; (1890) 1,850; (1900) 1,696.

Wilton, JOSEPH, R. A.: sculptor; b. in London, England, in 1722; studied sculpture at Brabant, at Paris, and at Rome, where he gained the jubilee gold medal of Pope Benedict XIV.; spent eight years in Italy, chiefly occupied in copying ancient statues, after which he returned to England; was appointed director of the Duke of Richmond's art gallery in Spring Gardens; became the most popular sculptor in England; was a friend and patron of Richard Wilson the painter, and of Baretti, the lexicographer, and was one of the founders of the Royal Academy. Among his best-known works were busts of Bacon, Cromwell, Newton, Swift, Wolfe, Chatham, and Chesterfield, and the monuments of Wolfe, Admiral Holmes, and Stephen Hales. D. in London, 1803. Revised by RUSSELL STURGIS.

Wilton Carpets: See CARPETS.

Wilts, or **Wiltshire**: an inland county in the southwestern part of England. Area, 1,375 sq. miles. In the northern part are extensive plains well suited to agriculture and dairy-farming, which are carried on with great energy. Many hogs are raised here, and Wilton bacon and Wilton cheese are famous. The southern part is hilly, and on the bleak downs a great number of sheep of a fine breed is reared. Woolen stuffs are extensively manufactured; also some cotton, silk, and iron manufactures are carried on. Pop. (1891) 262,551; (1901) 271,372.

Wim'bledon: town; in the county of Surrey, England, 8½ miles S. W. of St. Paul's, London (see map of England, ref. 12–J). It is principally noted for its common of 628 acres, where the annual meetings of the National Rifle Association were formerly held. Pop. (1891) 25,758.

Wimpffen, French pron. *văn'faăn'* EMMANUEL FÉLIX, de: soldier; b. at Laon, department of Aisne, France, Sept. 13, 1811; began his military career in Algeria; was made a brigadier-general in the imperial guard in 1855; distinguished himself both in the Crimean and in the Italian wars; was made a general of division in 1859; commanded at Lyons, and was subsequently made governor, first of the province of Algeria, then of that of Oran. In the Franco-German war he received the command, first of the Twelfth, then of the Fifth Army-corps, and during the battle of Sedan, after MacMahon had been wounded, he assumed the command of the whole army, and as such signed the capitulation of Sedan. He published several letters concerning the catastrophe, the memoir *Sedan* (1871) and *Réponse au Général Ducrot* (1871). He was violently attacked by *Le Pays*, and was unsuccessful in the libel suit he instituted against its editor, Paul de Cassagnac. In 1876 he ran for member of the Chamber of Deputies for the arrondissement of St. Denis, but failed. D. Feb. 26, 1884. Besides the above-mentioned publications, he wrote *La Situation de la France et les Réformes nécessaires* (1873) and *La Nation armée* (1876). Revised by F. M. COLBY.

Win'amac: town (founded in 1838); capital of Pulaski co., Ind.; on the Tippecanoe river, and the Pitts., Cin., Chi. and St. L. Railway; 25 miles N. W. of Logansport, 92 miles S. E. of Chicago (for location, see map of Indiana, ref. 3–D). It is in an agricultural region, and has a new county court-house, Christian, Methodist Episcopal, Presbyterian, and Roman Catholic churches, public and parochial schools, 2 private banks, and 3 weekly newspapers. Pop. (1880) 835; (1890) 1,215; (1900) 1,684.

EDITOR OF "PULASKI COUNTY DEMOCRAT."

Winchell, ALEXANDER, LL. D.: geologist; b. at North East, Dutchess co., N. Y., Dec. 31, 1824; graduated at the Wesleyan University, Middletown, Conn., 1847; was teacher in Pennington Seminary, New Jersey, 1847–48, and of natural sciences at Amenia Seminary, New York, 1848–51, and at Mesopotamia Female Seminary, Alabama, 1851–53; was president of the Masonic Female University at Selma, Ala., 1853; became Professor of Physics and Civil Engineering at the University of Michigan 1853, and of Geology, Zoölogy, and Botany 1855; was president of the Michigan Teachers' Association 1859; State geologist of Michigan 1859–62; Professor of Geology in the Kentucky University 1866–69; director of geological survey of Michigan 1869–71; vice-president of the American Association for the Advancement of Science 1871; chancellor of Syracuse University 1872–74; lecturer in Vanderbilt University, Nashville, Tenn., 1876–78; Professor of Geology and Paleontology in the University of Michigan from 1879 to his death Feb. 19, 1891, at Ann Arbor, Mich. He was the author of *The First Biennial Report of the Geological Survey of Michigan* (1861); *The Grand Traverse Region* (1866); *Genealogy of the Family of Winchell in America* (Ann Arbor, 1869); *Geological Map of Michigan* (1865); *Geological Chart* (1870); *Sketches of Creation* (1870); *Geology of the Stars* (1872); *The Doctrine of Evolution* (1874); *Reconciliation of Science and Religion* (1877); *Preadamites* (Chicago, 1880); *Sparks from a Geologist's Hammer* (1881); *World-Life, or Comparative Geology* (1883); *Geological Excursions* (1884); and *Geological Studies* (1886). He revised portions of *Johnson's Natural History*, 1885. He was a member of numerous scientific societies both in the U. S. and in Europe. In 1890 he was elected president of the Geological Society of America. In American geology what is known as the "Marshall" group was established by him, and fourteen newly discovered species have been named after him. His paleontological researches established seven new genera and 304 new species, most of them fossil. Revised by C. H. THURBER.

Win'chendon: town (incorporated in 1764); Worcester co., Mass.; on the Miller river, and the Fitch. and the Boston and Albany railways; 18 miles N. W. of Fitchburg, 36 miles N. by W. of Worcester (for location, see map of Massachusetts, ref. 3–F). It contains the villages of Winchendon, Waterville, and Winchendon Springs; has the Murdock High School (building cost $100,000), 8 district schools, public library, 7 churches, a national bank with capital of $200,000, a savings-bank, the New England Home for orphan and destitute children, and a weekly newspaper; and is principally engaged in the manufacture of woodenware, toys, cotton goods, and wood-working machinery. The assessed valuation in 1894 was $2,262,297. Pop. (1880) 3,722; (1890) 4,390; (1900) 5,001.

Winchester: city; capital of Hampshire, England; on the Itchin; 60 miles W. S. W. of London (see map of England, ref. 13–I). It is the *Caer-Gwent* of the Britons and the *Venta Belgarum* of the Romans. After being taken in 495 by the Saxons, it received its present name, and was for several centuries the capital of England and the residence of its kings. In the thirteenth century it lost its trade, and since that time it has gradually declined. Its cathedral, built in the eleventh century, is a vast but heavy structure, containing many interesting monuments. It is 520 feet long; the breadth at the transepts is 208 feet; the nave is 351 feet long and 86 feet high; the central Norman tower is 186 feet high. Among the monuments of the cathedral are the tomb of William Rufus, the bronze figures of Charles I. and James I., the golden shrine of St. Swithin, etc. Winchester College, one of the great public schools of England, was founded here by Wykeham in 1369–93. Pop. (1891) 19,073.

Winchester: city (founded in 1830); capital of Scott co., Ill.; on the Big Sandy creek, and the Chi., Burl. and Quincy Railroad; 29 miles S. of Beardstown, 84 miles N. by W. of St. Louis, Mo. (for location, see map of Illinois, ref. 7–C). It is in an agricultural region; has a public high school, Baptist, Christian, Methodist Episcopal, Presbyterian, and Roman Catholic churches, 2 private banks, and 2 weekly newspapers; and has 2 grain elevators, 2 flour-mills, meat-packing works, sawmill, and plow and furniture factories. Pop. (1880) 1,626; (1890) 1,542; (1900) 1,711.

EDITOR OF "STANDARD."

Winchester: city; capital of Randolph co., Ind.; on the White river, and the Cleve., Cin., Chi. and St. L. and the Gr. Rapids and Ind. railways; 25 miles N. of Richmond (for location, see map of Indiana, ref. 5–G). It is in an agricultural and natural-gas region, and has several factories, a soldiers' monument, 2 private banks, and 3 weekly newspapers. Pop. (1880) 1,958; (1890) 3,014; (1900) 3,705.

EDITOR OF "DEMOCRAT."

Winchester: town; capital of Clark co., Ky.; on the Ches. and O., the Lex. and S., and the Louisv. and Nashv. railways; 18 miles E. of Lexington (for location, see map of Kentucky, ref. 3–I). It is in the famous Blue Grass region; contains the Kentucky Wesleyan College, the Cooper Female Institute, the Winchester Female College, public schools, water-works, electric lights, street-railway, 2 national banks with combined capital of $375,000, and a State bank with capital of $200,000; has a semi-weekly and a weekly newspaper; and is principally engaged in agriculture and stock-raising. Pop. (1880) 2,277; (1890) 4,519; (1900) 5,964.

EDITOR OF "DEMOCRAT."

Winchester: town (incorporated in 1850); Middlesex co., Mass.; on the Boston and Maine Railroad; 8 miles N. E. of Boston (for location, see map of Massachusetts, ref. 2–H). It has 7 churches, high school, 8 district schools, public library, savings-bank, town-hall (cost over $100,000), and a weekly and a monthly periodical; and is principally engaged in tanning and the manufacture of school furniture. The assessed valuation in 1894 was $6,206,125. Pop. (1880) 3,802; (1890) 4,861; (1900) 7,248.

PUBLISHER OF "STAR."

Winchester: town; Cheshire co., N. H.; on the Ashuelot river, and the Boston and Maine Railroad; 13 miles W. of Keene, 65 miles S. W. of Concord (for location, see map of New Hampshire, ref. 9–C). It contains the villages of Winchester and Ashuelot, 3 churches, high school, 3 libraries, a national bank with capital of $150,000, a savings-bank, and manufactories of woolen goods, lumber, palm-leaf hats, and butter and cheese. Pop. (1890) 2,584; (1900) 2,274.

Winchester: town; capital of Franklin co., Tenn.; on the Elk river, and the Nash., Chat. and St. L. Railway; 67 miles N. W. of Chattanooga, 85 miles S. S. E. of Nashville (for location, see map of Tennessee, ref. 7–F). It is in an agricultural, mining, and lumbering region, near the foot of the Cumberland Mountains, is a resort for invalids, and has two State banks with combined capital of $50,000, several saw, planing, and flour mills, carriage and wagon factories, marble-works, wood-working factories, and a weekly newspaper. Pop. (1880) 1,039; (1890) 1,313; (1900) 1,338.

Winchester: city; capital of Frederick co., Va.; on the Balt. and O. and the Cumberland Val. railways; 88 miles W. by N. of Washington, D. C., 113 miles W. by S. of Baltimore, Md. (for location, see map of Virginia, ref. 3–G). It is in a wheat-growing region; has 14 churches, large public

school, 3 female seminaries, an academy, a national bank with capital of $100,000, a State bank with capital of $50,825, and a monthly and 3 weekly periodicals; and contains 4 glove-factories, 2 hosiery-mills, 2 steam planing-mills, flour-mill, a sumach and bark mill, tannery, paper-mill, shoe-factory, and a canning-factory. The place is the key to the valley of the Shenandoah, and during the civil war it was repeatedly occupied by the forces on either side, and in its vicinity were fought several battles. (See CEDAR CREEK.) The city contains national and Confederate cemeteries. Pop. (1880) 4,958; (1890) 5,196; (1900) 5,161.

EDITOR OF "REPUBLICAN LEADER."

Winchester, ELHANAN: clergyman; b. at Brookline, Mass., Sept. 30, 1751; began preaching to a Baptist church at Newton 1769; was pastor of a church at Rehoboth 1771, and was excommunicated in consequence of his views on close communion; went to South Carolina 1774; preached to the Negroes on the plantations on the Pedee river; became pastor of the First Baptist church at Philadelphia 1780, and, having adopted the doctrine of universal salvation, founded there a Universalist church 1781, after which he traversed several States to propagate his new doctrines, and preached in England 1787–94. He was one of the precursors of the modern system of Universalism, his doctrines being very similar to those preached by his contemporary, Rev. Dr. Charles Chauncy. He was the author of numerous religious treatises, pamphlets, sermons, and addresses, and of several volumes of verse. D. at Hartford, Conn., Apr. 18, 1797. Revised by J. W. CHADWICK.

Winchester, WILLIAM PAULET or POULET, K. G., Marquis of: b. in Hampshire, England, about 1475; dissipated large estates in youth; entered the personal service of Henry VII.; became comptroller and afterward (1536) treasurer of the household to Henry VIII.; was made Baron St. John Nov., 1537; received from Henry VIII. the order of the Garter; was appointed treasurer to Edward VI. 1549; made earl 1550 and Marquis of Winchester Oct., 1551; presided at the trial of Somerset Dec., 1551, in the capacity of lord high treasurer, which post he managed to retain under Mary and Elizabeth, and, according to the testimony of Fuller, "trafficked so wisely and prospered so well that he got, spent, and left more than any subject since the Conquest," the secret of his prosperity being given by himself in the words, "No oak, but an osier." He built a magnificent mansion in Hampshire called Basing House, afterward celebrated for its siege by Cromwell; entertained Elizabeth there in 1560, and died there Mar. 10, 1572. A volume entitled *The Lord Marques' Idleness, containing Manifold Matters of Acceptable Devise, as Sage Sentences, Prudent Precepts, Moral Examples, Sweet Similitudes, etc.*, was printed in 1586.

Winckelmann, *vink'el*-maăn, JOHANN JOACHIM: archæologist; b. at Stendal, Prussian province of Brandenburg, Dec. 9, 1717, in humble circumstances; studied theology at Halle, medicine at Jena; lived for several years as tutor in a private family, and from 1743 to 1748 as co-rector at the school of Seehausen in Brandenburg, and in 1748 went to Dresden as librarian and secretary to Count Heinrich von Bünau. Here his study of classical archæology began. Here also he published his first work, *Gedanken über die Nachahmung der griechischen Werke in Malerei und Bildhauerkunst* (1755). This brought him a pension of 200 thalers from Augustus III. of Saxony, and Winckelmann having joined the Roman Catholic Church went to Rome, where he had unrivaled opportunities for archæological and artistic studies. Soon the original and striking views which resulted from his researches attracted great attention, and in 1763 he was appointed prefect over the antiquities of Rome, and received also a position in the Vatican Library. He visited Florence, where he published *Description des Pierres gravées du feu Baron de Stosch* (Florence, 1760): Naples, Herculaneum, and Pompeii, whence he sent to Dresden *Sendschreiben von den herculanischen Entdeckungen* (1762) and *Nachricht von den neuesten herculanischen Entdeckungen* (1764); and from Rome he contributed many minor essays to various German periodicals, such as *Von der Grazie, Von der Fähigkeit der Empfindung des Schönen*, etc. In 1764 appeared his principal work, *Geschichte der Kunst des Alterthums* (Dresden); and in 1767 his *Monumenti antichi inediti* (Rome). In 1768 he started on a visit to his native country. Arrived at Vienna, he determined to proceed no farther, but on his return he was murdered at Trieste, June 8, 1768, by a professional thief who attempted to steal some rare gold coins from him. Winckelmann is generally admitted to be the father of modern archæology. A collected edition of his works begun by Ternau and completed by Heinrich Meyer and Schultz, appeared in Dresden 1808–20, in 8 vols., and another by Eiselein (12 vols., Donaueschingen, 1825–29). His correspondence was edited by F. Forster (Berlin, 1824, 2 vols.). Also see Justi, *Winckelmann, sein Leben, seine Werke und seine Zeitgenossen* (2 vols., Leipzig, 1866–72). Revised by RUSSELL STURGIS.

Wind: See WINDS.

Winder, WILLIAM HENRY: soldier; b. in Somerset co., Md., Feb. 18, 1775; graduated at the University of Pennsylvania, and became a member of the Baltimore bar 1798. In Mar., 1812, he was appointed a lieutenant-colonel of the Sixteenth Infantry, and colonel in July; commanded a successful expedition to the Canada shore from Black Rock Nov. 28, 1812; promoted to be brigadier-general Mar., 1813; was taken prisoner at Stony Creek June 6. In May, 1814, he was appointed adjutant and inspector-general, and when the British forces under Gen. Ross landed below Washington he was placed in command of the militia summoned to defend the capital; was defeated at the battle of Bladensburg, and was unable to prevent the occupation of Washington by the enemy. Honorably discharged June, 1815. he returned to his profession in Maryland, in which he became distinguished, as well as in the State Senate, of which he was a member. D. in Baltimore, Md., May 24, 1824.—His son, JOHN HENRY, b. in Maryland, 1800, graduated at West Point in 1820; was breveted major and lieutenant-colonel for gallantry in the Mexican war; resigned his commission of major of artillery Apr. 27, 1861, and joined the Confederate army, in which he became a brigadier-general; was the commandant of Libby Prison and Belle Isle, and later of Andersonville. D. at Branchville, S. C., Feb. 7, 1865.

Revised by JAMES MERCUR.

Win'dermere, or **Winandermere**: the largest lake of England; 14 miles long and 1 mile broad. It lies in Lancashire, and is celebrated for the rich beauty of its shores. Its outlet is the small river Leven, which flows southward into Morecambe Bay, an extensive inlet of the Irish Sea, on the west coast of England. A group of islands, the largest of which contains 28 acres, is situated in the center of the lake. The village of Windermere is about a mile from the east shore of the lake. Pop. 1,500.

Wind-flower: See ANEMONE.

Windgalls: puffy swellings about the fetlock joints of horses. They are the same as synovial ganglia or "weeping sinews" in man. Tight bandaging, irritant ointments, and rest may apparently cure them, but they are liable to recur. They usually appear on the hind legs in the form of little oval sacs between the back sinews and the bones, just above the fetlocks. At first the puffs, or windgalls, feel soft and elastic, but after some time, if the animal is employed at hard labor, they will become firm and hard. Rubbing is considered the most effective remedy.

Windham: town (incorporated in 1762); Cumberland co., Me.; on the Presumpscot river, near Lake Sebago; 12 miles N. W. of Portland (for location, see map of Maine, ref. 10–B). It contains the villages of Windham Center, South Windham, North Windham, and Newhall, and has a public library and important manufactures. Pop. (1880) 2,312; (1890) 2,216; (1900) 1,929.

Windham, WILLIAM: statesman; b. in London, England, May 3, 1750; educated at Eton, at Glasgow University, and at University College, Oxford; traveled on the Continent; became a member of Dr. Johnson's Literary Club and a friend of Burke and Fox, with whom he co-operated in denouncing the American war; distinguished himself as an orator; was chief secretary to Lord Northington, Lord-Lieutenant of Ireland, 1783; was returned to Parliament from Norwich in 1784; was one of the managers of the impeachment of Warren Hastings 1787; was a strenuous opponent of the French Revolution and advocate of war with France; was Secretary at War in Pitt's cabinet 1794–1801; opposed the Peace of Amiens 1802; was again Secretary at War, and also for the colonies, in the Grenville administration 1806–07; after which, declining a peerage, he remained in opposition and denounced the Copenhagen and Walcheren expeditions. D. in London, June 4, 1810. He had a great reputation for oratory, and possessed brilliant conversational powers, but as a statesman he lacked vigor and tenacity. He was nicknamed "The Weather-

cock." His *Diary* from 1784 to 1810 was published by Mrs. Henry Baring in 1886, and a *Life* by Thomas Amyot was prefixed to an edition of his *Speeches in Parliament* (3 vols., 1806). His *Select Speeches* (Philadelphia, 1837) were edited in the U. S. by Robert Walsh, who wrote a biographical sketch.

Windhover: See KESTREL.

Windisch, *vin'dish*, ERNST, Ph. D.: philologist; b. in Dresden, Saxony, Sept. 4, 1844; educated at the University of Leipzig; was employed in cataloguing Sanskrit manuscripts at the India office library in London 1870–71; professor extraordinary at Leipzig 1871; Ordinary Professor of Comparative Philology and Sanskrit at Heidelberg 1872–75, at Strassburg 1875–77, and Professor of Sanskrit at Leipzig since 1877. Since 1880, also, he has been editor of the *Zeitschrift der Deutschen Morgenländischen Gesellschaft*. Among his numerous works are *Der Heliand und seine Quellen* (Leipzig, 1868); *Untersuchungen über den Ursprung des Relativpronomens* (in Curtius's *Studien zur Griech. und Lat. Grammatik*, vol. ii., Leipzig, 1869); *Syntaktische Forschungen* (with B. Delbrück; vol. i., on the subjunctive and optative in Sanskrit and Greek, Halle, 1871); *Kurzgefasste Irische Grammatik* (Leipzig, 1879; Eng. trans., *A Concise Irish Grammar*, Cambridge, 1882); *Irische Texte* (Leipzig, 1880; 2d series, with W. Stokes, i., 1884, ii., 1887; 3d series, i., 1891); *Georg Curtius* (Berlin, 1887); *Ueber das Nyāyabhāshya* (Leipzig, 1888); *Hivuttaka* (Pali Text Society, London, 1880). S. A. T.

Windischgrätz, *vind'ish-grāts*, ALFRED, Prince von: Austrian field-marshal; b. at Brussels, Belgium, May 11, 1787; entered the army in 1804, and rose rapidly in the service, distinguishing himself especially in the campaigns of 1813–14. In 1826 he became major-general and governor of Prague, and in 1833 general of division and lieutenant field-marshal. After the Napoleonic wars he saw no field service till the Revolution of 1848 broke out in the Austrian empire. The Bohemian agitation for the establishment of a separate self-government under the direct authority of the emperor was for the moment successful, and a Bohemian congress assembled at Prague with the emperor's permission, but here, as elsewhere, the radical element gained the upper-hand. The people demanded to be armed. Windischgrätz refused, and fighting began in the streets. His wife and son were killed by the insurgents, but he continued the contest, and by June 14 was completely successful. The Bohemian congress was dissolved, and Prague placed in a state of siege. No further trouble was experienced from Bohemia during this revolutionary year. Windischgrätz was then placed in command of all the Austrian forces outside Italy, and summoned to Vienna, which was at the mercy of the revolutionary mob. Aided by Jellachich he succeeded in restoring the imperial authority in the city (Oct. 31), after which he entered on the campaign against the Hungarians. In this campaign, after gaining some advantages, he remained inactive, and sought to subdue the country by threatening decrees against the revolutionists, leaving them in the meanwhile time to gather their forces and secure strong positions. Finally, he retreated without accomplishing anything of importance. Superseded in the command, he retired to his estates in Bohemia and applied himself to the preparation of his *Winterfeldzug 1848-49 in Ungarn* (Vienna, 1851). D. Mar. 21, 1862. F. M. COLBY.

Windlass [corruption of M. Eng. *windas*, from Icel. *vindāss*, windlass, winding-pole; *vinda*, to wind + *āss*, beam, pole: Goth. *ans*, pole (?)]: a form of the wheel and axle, in which the axle is horizontal, while in the capstan it is usually vertical. The axle is made to revolve either by means of handspikes or a winch. The mathematical principles involved are precisely those of the wheel and axle.

Windmills: devices for utilizing the energy of the wind as a motive-power; specifically, wind-driven mechanisms for grinding, pumping, etc. The first use of the windmill for doing work is unknown. Prof. John Beckman, of the University of Göttingen, who made a thorough investigation in regard to its history, and whose work was translated by Mr. William Johnson (London, 1817), found a reference to the use of the windmill among the Bohemians as early as 718, but no trace of it farther East before its more extensive use in France and Germany. Mention was made of the use of windmills in 1105 and again in 1143, but no authentic information in regard to their mode of construction is found until a still later period.

A windmill has four essential parts—a wind-wheel; a shaft or axle to which the wheel is attached, and which is made to rotate by the wheel; wheels and shafts for transmitting the power to the desired place; and a frame for supporting the wheel and other machinery. The manner of making the wheel find the wind has given rise to two classes of these old mills. One, in which the whole frame is turned by hand, as shown in Fig. 1, is called the German mill. The frame rests

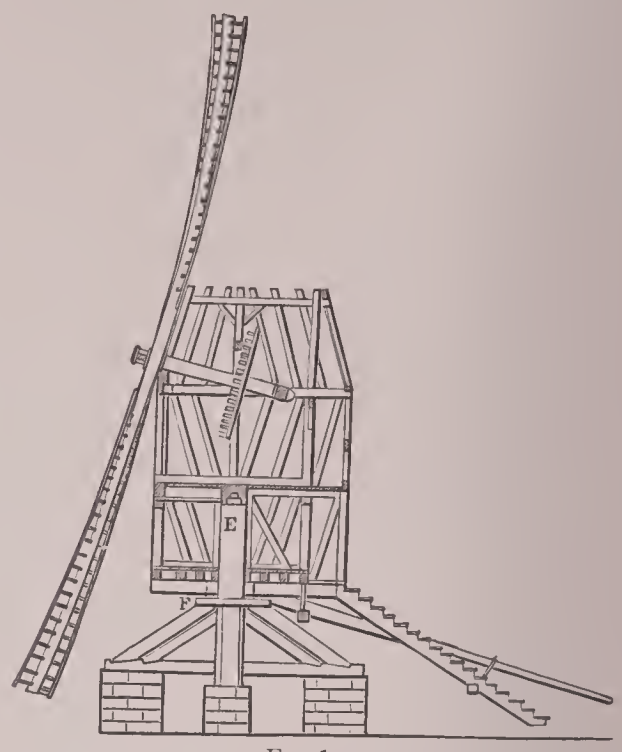


FIG. 1.

upon and turns about the post E. In the other only the dome containing the shaft and bevel-wheel is rotated, as shown in Fig. 2. In this case the shaft A and bevel-wheel attached are stationary, but free to rotate. The movement of the dome in this case is sometimes made automatic by extending an arm to the rear of the wind-wheel, and mounting thereon a small wind-wheel, S, whose axis is connected by suitable gearing to the dome in such a way as to turn the dome when the small wheel S rotates. When the wind-wheel is firm to the wind the plane of the small wheel S will

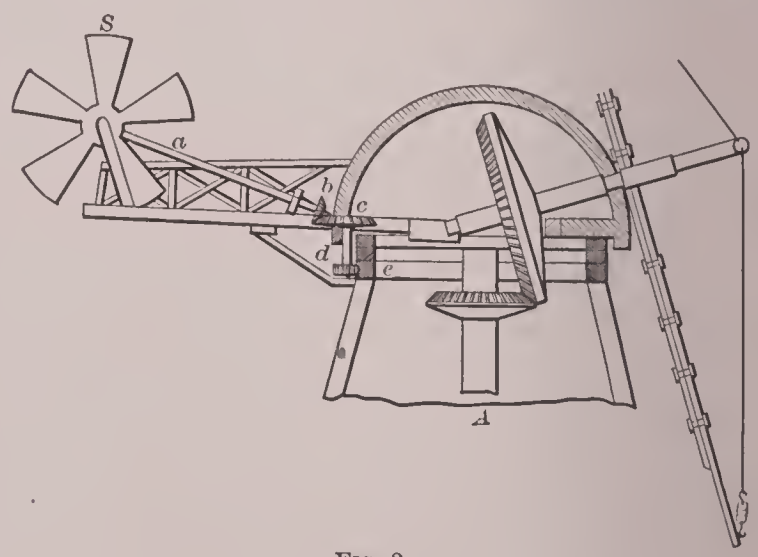


FIG. 2.

be in the direction of the wind and will be at rest, but when the wind veers it will strike the small wheel, setting it in motion and bringing the wind-wheel into the proper position by driving the shaft *a*, pinion *b*, beveled-wheel *c*, and pinion *d*, which engages a rack *e* extending around the tower.

The wind-wheel was made of four arms, called whips, fastened at right angles to each other and to the shaft. These arms were 30 or 40 feet long and sometimes longer, sometimes 12 inches in diameter at the large end and 5 or 6 inches at the small end. They were either round or rectangular. Rods were put through them transversely, not in a plane but in a spiral, so that the canvas which was attached to them made a warped surface, as shown in Fig. 3. This form is indicated both by theory and experience. The first rod was about 5 or 6 feet from the shaft and 2 feet or so long, and

made an angle of about 40 degrees with the face of the wheel, the last about 12 degrees, and was about 6 feet long. Sometimes they were symmetrical in reference to the arm, projecting the same distance each side of it; but in others they were unsymmetrical, as shown in Fig. 7, and more nearly rectangular. The shaft of the wheel, when made of wood, was sometimes 20 inches in diameter, and gave rise to much friction. When of cast iron they have been made 12 inches in diameter and hollow.

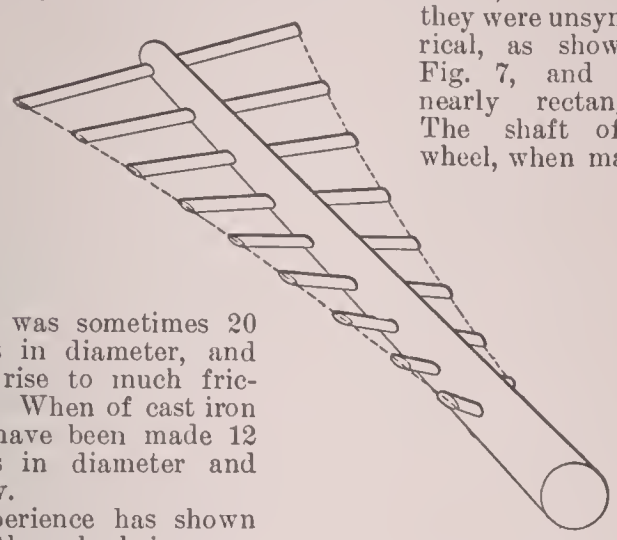


Fig. 3.

Experience has shown that the wheel is more efficient if its axis be inclined upward from 8 to 15 degrees, as shown in Fig. 1, but for pumping it is better to substitute a crank or eccentric for the bevel-wheel, in which case the shaft should be horizontal, as in Fig. 9.

A somewhat definite statement in regard to these mills is given in a report by Coulomb, a French scientist, who about the year 1820 made careful observations upon some fifty Dutch windmills near Lille, in Flanders, which were used for the extraction of oil from rapeseed. They were about 66 feet in diameter, width of sails about 6 feet; the sail began about 6 feet from the shaft, where it made an angle with the plane of rotation of 30 degrees, and at the extreme end it was about 12 degrees. The shafts were inclined from 8 to 12 degrees to the horizontal. With a wind of 20·5 feet per second, or nearly 15 miles per hour, when the wheel made thirteen revolutions per minute, it developed about 7 horse-power, which included nearly one-half a horse-power, or about 7 per cent. of the power, for the friction of the shaft. The friction was determined in still air by applying weights at the arms to produce the motion; and the velocity of the wind was determined by stationing two men on slight elevations, 150 feet apart, and noting the time required for a feather to pass over that distance. The sails had over 200 sq. feet each. The wind velocity was from 8 feet per second to 28 feet, with a velocity of the wheel at its circumference of 22 feet to 72 feet per second.

When a sail is compelled to travel across the course of the wind it may be made to move with a greater velocity than the wind by placing the sail at a small angle to the weather. Thus if A B be the direction of the wind (Fig. 4) and the sail, B D, be compelled to travel parallel to F G, if the sail goes a distance E B while the wind goes the distance D E, then when the point E reaches B, D will be directly back of B. The angle D B E may be so small that B E will be several times D E. It had been observed that the velocity of the outer ends of the arms of a Dutch wheel exceeds considerably that of the wind for the best effect. If the wheel be run freely, doing no work except overcoming the friction of the shaft and resistance of the sails, it will attain a finite uniform velocity; then by applying a resistance in the form of useful work, the velocity may be diminished and more external work be done until the work becomes a maximum. According to Smeaton, the velocity for doing maximum work is two-thirds that it would have if running free, with the machinery below the shaft disconnected. A similar ratio obtains with hydraulic turbines. More than four arms may be used advantageously, and later they were increased to twelve or more. According to Smeaton, seven-eighths of the space within the circle circumscribing the wheel may be used for sails, and the power is diminished if more than that amount of sails be introduced.

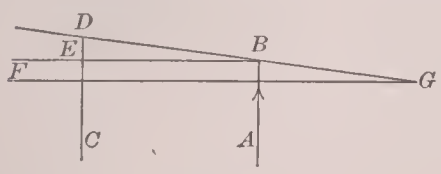


Fig. 4.

Horizontal wheels have been used, in which case the axis is vertical, thus avoiding some of the gearing which is necessary in the vertical wheel. In such wheels if plane sails are used, one-half the wheel must be covered so as to be out of the action of the wind, or other devices be used to put the returning sails out of wind. Such mills have been constructed similar to inflow water turbines, having curved vanes in the wheel and fixed curved guides outside for deflecting the wind into the wheel, which work independently of the direction of the wind. Also since the force of the wind is greater against a concave surface than against a similar convex one, buckets like hollow hemispheres have been used, placing them around the circumference of the wheel. These also work independently of the direction of the wind; but during one-half or more of the rotation the back of the buckets offer resistance to rotation, while the sails, as above described, are effective throughout the circumference. Theory and experience both indicate that horizontal wheels are only about one-fourth as powerful as vertical ones of the same size with sails, so that what is gained by gearing is more than lost in power.

The Sails.—It is not only necessary that the face of the wheel should be toward the wind, but the amount of sail presented to the wind should vary with the speed of the wind where the work to be done is nearly constant. As the speed of the wind increases the amount of sail should be decreased so that the speed of the mill will not be too great. Many ingenious devices have been used to accomplish this object. One is to have the cross-rods project from one side only of the arms, and be sufficiently flexible, so that as the pressure of the wind increases the sticks will bend and so present less canvas to the wind. Another is to hang the canvas at one edge on the arm and support the outer edge by a rope which passes to the next arm, over a pulley down that arm, while all four (or more) of the ropes pass down the hollow shaft at the other end and are attached to a weight. As the pressure of the wind increases it raises the weight and permits the sails to slope more, and as the wind slackens the weight draws the sails back into position. A windmill in Belgium known as Thirion's, with some fifteen narrow sails, had their outer edges attached to a kind of circular frame, which was moved by a centrifugal governor, and set the sails more or less to the weather. This mill had a peculiar mode of connecting-shafts not parallel, consisting of a strong steel spiral spring (Figs. 5 and 6). The strips forming the helix were about half an inch thick and 1½ inches wide, and the diameter of the coil about 12 inches. Such a coupling, when properly made, transmits the power when the shafts make almost any angle with each other. The principle has been applied on a large scale in machine-shops for giving rotary motion to portable metal drills and bits for boring wood, and is known as flexible shafting.

Fig. 5.

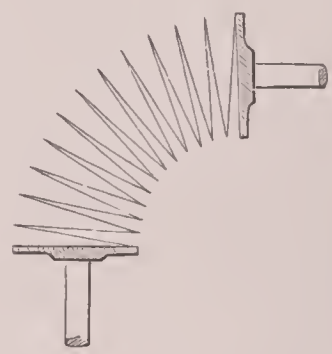


Fig. 6.

For pumping, the sails may be fixed and the power regulated by a movable fulcrum. The pump piston-rod being attached to one end of a lever, while the other is operated by a cam or eccentric on the shaft of the wind-wheel, the fulcrum between the ends may be moved by a centrifugal governor, so that when the wind is low the length of the arm nearer the mill will be increased, and consequently the other arm shortened. Such an arrangement permits the mill to do some pumping when the velocity of the wind is low. The wheel may be brought to rest by a brake operating on the shaft or on some of the gear-wheels.

Of the Dutch wheels one is mentioned that measured 150 feet in diameter, and exaggerated statements were made to the effect that some of them were 1,000 horse-power. In some cases each mill had a superintendent who gave orders,

like the captain of a sailing craft, to increase or diminish the sail or shift the position of the wheel according to the strength or direction of the wind. Fig. 7 is a view of one credited to the year 1200.

Fig. 7.

American Windmills. — The Dutch windmills are chiefly of historic interest. Commercially and practically they are being displaced by the American mills. No country has done so much to improve the windmill as the U. S., where it has been bettered in form, in mode of working, and in the mode of manufacture. The parts of the better mills are made to gauge and with templates, so that the parts are interchangeable. This greatly lessens the cost of manufacture and is a convenience in repairing.

The characteristic features of the American mill are the large number of narrow radial slats or sails (plane when made of wood, or generally curved when made of iron); the rudder or tail-piece; the automatic adjustments; and the pyramidal tower, as shown in Fig. 8. Each of these elements is subject to many modifications. The tower was formerly of wood, made on the spot, but more recently it is made of steel, fitted in the shop, and shipped to the place where it is to be erected. Some towers are made of brick or stone. The upper stories may be used for storage-tanks, and the lower ones for sawmills or other small machinery. They are of all heights, suited to circumstances, usually from 30 to 70 feet. *The Scientific American* describes one 150 feet high, claimed to be the highest and strongest windmill tower in the world, on which is mounted a wheel 22½ feet in diameter. Steel frames are rectangular or triangular, as desired.

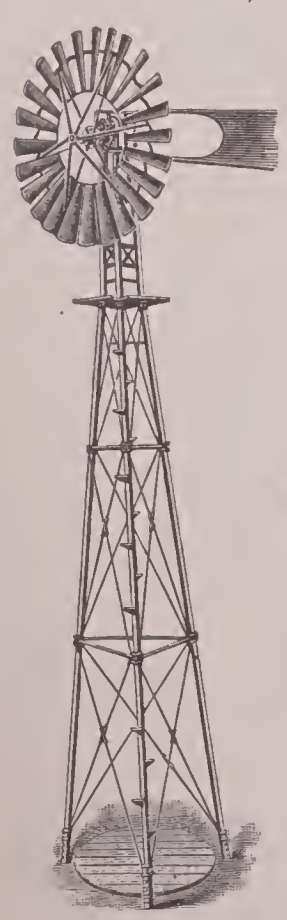


Fig. 8.

Many firms are engaged in the manufacture of these semi-portable mills. Wolff on *Windmills*, a book which contains much valuable information, written prior to 1885, states that in some cities more than 5,000 are made annually; at present (1895) the writer is credibly informed that one firm is manufacturing over 16,000 a year, from which it does not seem rash to infer that some 50,000, more or less, are made in the U. S. annually. One firm advertises that during eighteen years following the Centennial Exposition, 1876, they sold $20,000 worth of their machinery in Africa. This, though vague, gives some idea of the business done from a source least expected. They are shipped to all civilized countries. More than one system of American mills is manufactured in Germany and elsewhere.

Windmills are used for a great variety of purposes—on railways for pumping water into storage-tanks for supplying locomotives; at residences, for family uses; at nurseries, for watering plants, etc.; on prairies, for irrigation and watering cattle, etc.; for threshing, grinding, feed-cutting, and the like; and they might be made to run a sewing-machine, to do laundry-work, run a dish-washer, blow fans in a dining-room, etc. American mills are made of all sizes, from $\frac{1}{25}$ to 4 horse-power, the latter of which may be some 30 feet in diameter. These are made at the shop, ready to be set up when shipped. Special wheels of 8 or more horse-power are made to order. The rating per horse-power is indefinite. A mill that is rated at 4 horse-power with a fair breeze—say, 20 miles per hour—would be nearly 14 horse-power at 30 miles per hour, and 32 horse-power at 40 miles. But, with all their good qualities, this intermittent power is not suited to manufacturing purposes, when the power needed must be practically uniform and produced at will. Numerous windmills were displaced by the introduction of steam into Great Britain. Both have their proper place, and each readily finds its own. In some cases the windmill may serve as an auxiliary to the steam-engine. At Fair Haven, England, "a 15 horse-power windmill raised in ten months 21,000,000 gal. of water 109 feet, at a saving of 100 tons of coal."

Adjustments.—In order to maintain a more uniform speed with winds of varying velocities, self-regulating devices are made. In the "solid wheel" this is accomplished by turning the wheel "out of the wind." One way of accomplishing this is by means of a lateral vane placed back of and parallel with the face of the wheel. The wind, by acting against this vane, will turn the wheel to one side so that less surface is presented to the wind. The rudder, being parallel or nearly so to the course of the wind, permits the side vane to operate quickly; but that it shall not operate too quickly balancing-weights are used which must be raised while turning the face of the wheel. These weights also act to bring the wheel, when the wind slackens, back into the wind. This system is represented in the Corcoran wheel, Fig. 9,

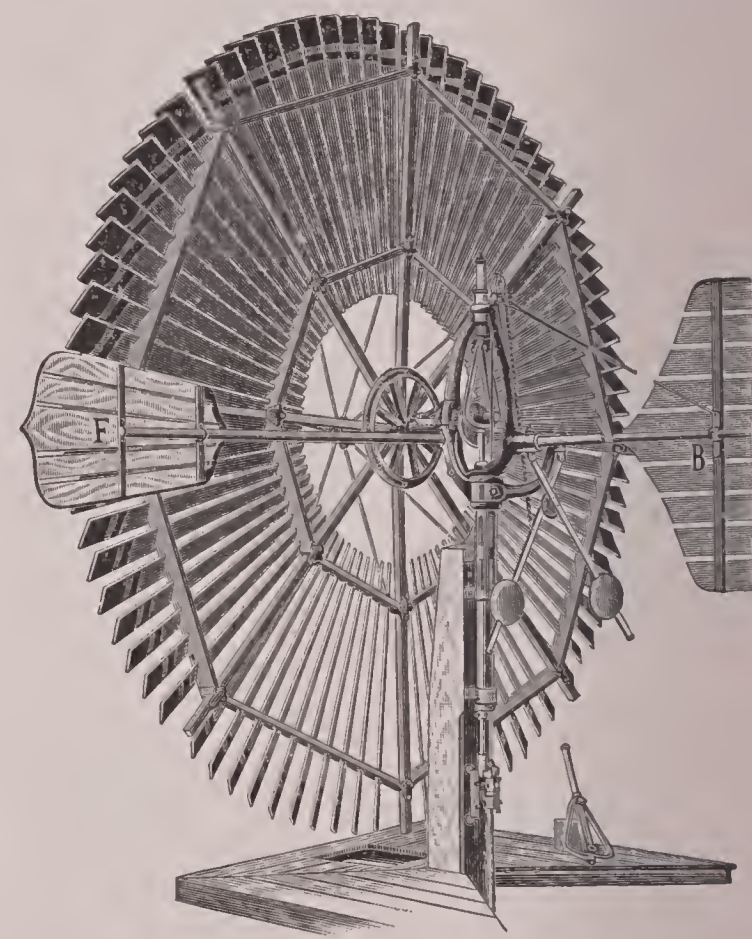


Fig. 9.

in which B is the rudder, and F the side vane. The first solid-wheel windmill using the side vane was the Eclipse, invented by L. H. Wheeler, formerly of Massachusetts. His first patent was issued in 1867, and his mills are manufactured at Beloit, Wis.

The wheel may also be turned out of wind by placing the vertical support one side the axis of the wheel; then the pressure of the wind against the wheel will turn the wheel about the vertical axis. The Stover windmill is of this type. The plane of the rudder is from 3 to 6 inches to one side of the line of the axis of the wheel, being more for the larger wheels. An objection to this adjustment is that the wheel is never fair with the wind. The Strong windmill is also of this type.

Again, the solid wheel may be adjusted by being so hinged that the wheel may be turned away from the wind while the rudder remains in the plane of the wind. The wheel is held against the rudder by a weighted lever, and when the wind is so strong as to turn the wheel aside it raises the weighted lever at the same time, which, by descent, brings it back into position when the force of the wind slackens. The Buchanan wheel is of this type.

Again, wheels are regulated without a rudder by being

so placed as to receive the wind from behind the tower. The tendency in this adjustment is for the wind to keep the wheel fair with the wind; and a vane is placed beyond the wheel perpendicular to its face, which turns the wheel away when desired. This vane is attached to a weighted lever, which it is forced to raise when turning the wheel away, and which brings the wheel back into fairness when the wind slackens. The Regulator and the Champion windmills are of this type. The weight, being all on one side of the column, produces cross strains on the supports. In some more recent designs the wheel has been balanced by a counterweight, as shown by the star in Fig. 10. The wheel here shown is regulated by a centrifugal governor described below.

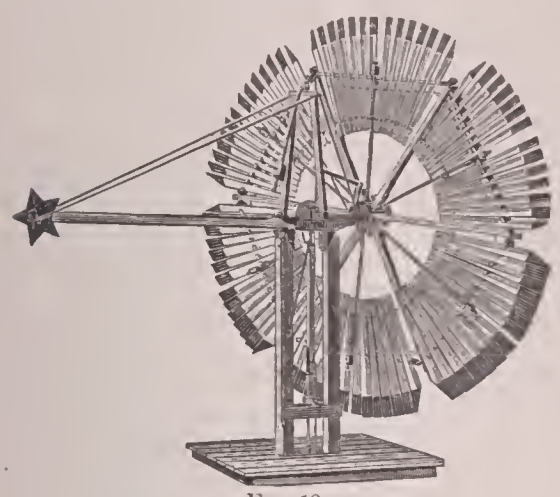


Fig. 10.

The action of the wind on the wheel is equivalent to a mechanical couple, and as the resistance is taken off at one point there is a tendency to force the wheel around on the turn-table in the direction of rotation, causing the wheel to turn out of the wind. A weighted lever resists this tendency, but when the pressure of the wind is sufficiently great it raises the weight, and when the wind slackens the weight brings the wheel into the wind again. In this way an adjustment is made, and has been found to work well with small wheels. The Woodmanse windmill is a type of this adjustment.

The speed may also be adjusted by turning the slats, by means of a centrifugal governor, so that they will present more or less surface to the wind. This is called the "sectional wheel," as opposed to the solid wheel, and was invented by Daniel Halliday (patented in 1854). The Halliday was long manufactured by John Burnham, formerly of Connecticut and later of Batavia, Ill., who is called the "father of the American system." The Halliday Standard wheel is shown in Fig. 11. The arms of the wheel are firmly secured to the spider C C, which is firmly secured to the shaft. Y Y are pivoted elbows to which are attached the regulating-rods carrying centrifugal weights, Z. The regulating-rods are connected directly with the slats, so that as Y is moved to the left by the centrifugal weights the edges of the slats are turned more to the weather. To force them back as the wind slackens, the forked lever F, carrying a weight, W, forces the spider D forward, which, being joined to Y by the links *a*, forces Y in the opposite direction from that caused by the centrifugal weights Z. By raising the weight W by means of a cord or chain passing over a pulley and extending to the ground, the edges of the slats may be presented to the wind and the mill stopped. This mill has been very extensively used on railways for filling water-tanks. The Adams mill is governed like the Halliday, but instead of a spider it has a spring on the hub of the wheel, set for a given speed, and when that speed is exceeded the spring is curled up, retarding the motion of the cylinder to which it is attached, pulling the vanes out of wind. From a scientific standpoint the centrifugal governor appears the most perfect, but, practically, the hinging of the slats may make the wheel less stable and less durable than the solid wheel, and the side vane adjustment seems to serve well in practice.

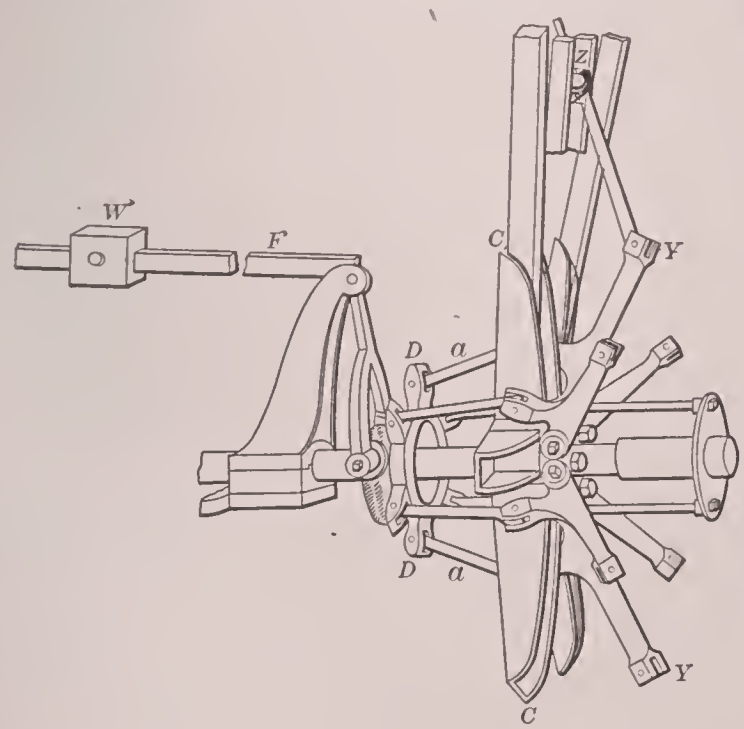


Fig. 11.

It is quite possible that too much importance has been attached to perfect regulation. There are comparatively few times in the year when a mill will run at a dangerous speed, and it may be better to make the wheel solid and let it run freely without any adjustment up to the dangerous speed, and provide only for the excess. This may not only simplify the construction, but also make the wheel more efficient and more durable.

The aëromotor, shown in Fig. 12, has been introduced to the public at a more recent date. It is the invention of Thomas O. Perry, a graduate of the University of Michigan. After a long experience with this class of mills, and of experimental tests extending over some two years, during which he made over 5,000 dynamometric measurements and tested 61 different forms of wheels in regard to the forms of vanes, the modes of construction, and the best methods of management, he invented this wheel. He appears to have done for the windmill what Poncelet did for hydraulic motors, by increasing the efficiency in many cases several fold over previous wheels. The wheel is made of steel, the vanes are curved and riveted to the circular sections, properly braced with tie-rods; all obstructions to the free flow of wind through the wheel are avoided as far as possible, and all unnecessary adjustment avoided. When not used the rudder may be thrown around parallel with the wheel. It runs with a light breeze, and is durable.

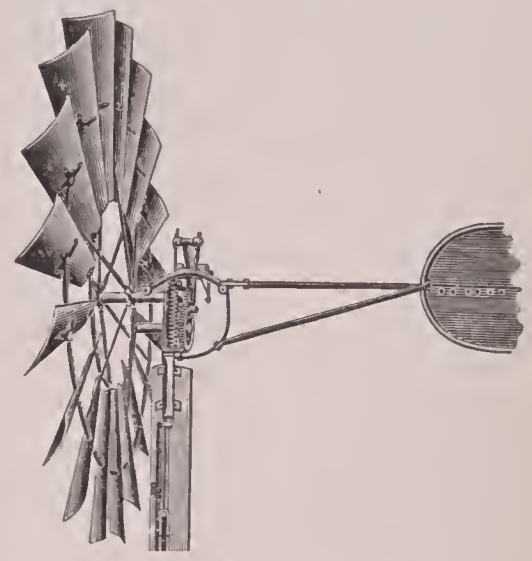


Fig. 12.

Formerly the upper end of the pump-rod was attached directly to a crank driven by the shaft of the wheel, but in many mills of the present day the speed is reduced by gearing. The object is to permit a longer stroke for doing the same work, thereby allowing more time for the valves to get seated; also by reducing the length of the crank, for which provision is made, a short stroke is produced, thus allowing some work to be done with a light breeze. Although not the original inventor, Perry claims to have been the first to have made it a success with the public.

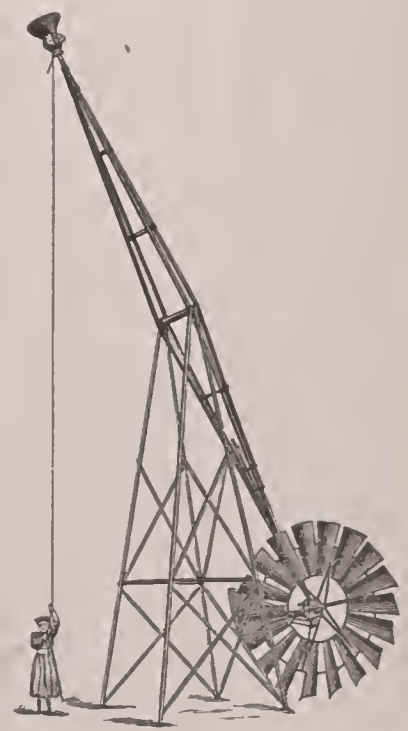


Fig. 13.

Perry also invented the tilting-tower, shown in Fig. 13. Its object is to lower the wheel to the ground for convenience in oiling and repairing.

Some pumping-mills are provided with an automatic arrangement, operated by a float, for throwing the mill completely out of the wind when the tank is nearly full, and bringing it into the wind by a weight when the tank is nearly empty.

Action of the Wind.—A windmill is a prime mover. Its conditions of working differ from those of other motors. Its source of power is not stored nor controllable like that of other powers, but is subject to "the freaks of the wind." Its use, therefore, is chiefly limited to small powers, and where intermittent and irregular power is valuable. These conditions are supplied in a vast number of cases all over the world.

In order to investigate the mechanical properties of the windmill some knowledge of the action of wind is necessary. Wolff, in his work on the *Windmill*, from the records of the Signal Service, gives the average velocity of the wind for each month of the year for fourteen cities widely separated in the U. S., the general average of which is 5,769 miles per month, or about 8 miles per hour; hence it is probable that during half the time it exceeds this amount, and that comparatively few days are likely to pass during which some work may not be done. It is difficult to get the actual velocity of a body of wind because it is so "streaky"—the velocity not only being variable at any given point, but very different from that a few feet distant. The extremes above and below a mean are very great, so that tables should be considered as only approximations, more or less close, to mean values. The pressure of the wind against a plane varies with the temperature, the barometric pressure, and square of the mean velocity. The following table is adopted for ordinary calculations, and is sufficiently accurate for a temperature of about 45° F. at the level of the sea, and is known as Smeaton's results:

VELOCITY OF THE WIND.		PRESSURE.	Remarks.
Miles per hour.	Feet per second.	Pounds per sq. ft.	
1	1·47	0·005	
2	2·93	0·020	Just perceptible.
3	4·40	0·044	
4	5·87	0·079	Gentle wind.
5	7·33	0·123	
10	14·67	0·493	Brisk gale.
15	22·00	1·107	
20	29·34	1·968	Very brisk.
25	36·67	3·075	
30	44·01	4·429	High wind.
35	51·34	6·027	
40	58·68	7·873	
45	66·01	9·963	Very high storm.
50	73·35	12·300	
60	88·02	17·715	Great storm.
80	117·36	31·490	Hurricane that tears up trees, destroys buildings.
100	146·70	49·200	Immense hurricane.

Extreme pressures and extreme velocities have been reported as high as 180 miles per hour, and pressures of 71 lb. per square foot, but these are exceptional cases, and windmills commercially made are not expected to meet such emergencies.

Mr. Perry, from his dynamometric tests, found that the power of the best-designed wheel that he made gave only 25 per cent. of the power, or energy, of the wind; and that this was more than 80 per cent. above the best commercial wheel which he used in his tests. In these tests the wheel was forced with a known velocity against still air, and the result would be different for a wheel working in variable currents. Since the average of the energies of variable currents exceeds the energy of the average current, the efficiency is probably higher than that given above. The most prejudicial resistance which the wheel has to overcome is the resistance of the air itself.

The efficiency is work done compared with the cost of doing it, and the cost includes the first cost, interest on the capital invested, deterioration, repairs, attendance, lubrication, and fuel (when used) or other power. The last does not enter into consideration in the case of the windmill. The mechanical efficiency of the windmill can not be determined with accuracy, but this is not a serious obstacle commercially, for the actual and continued use of machines and the growth of the business is the best guarantee of merit and economy.

Wolff, writing prior to 1885, made numerical comparisons between windmills and some other motors. He concluded that a windmill employed in pumping water is from 1·75 to 2·25 times as economical as a steam-pump, three times as economical as an Ericsson hot-air engine, and 2·25 times as economical as a gas-engine, all doing the same work; but the cost of the windmill has been much reduced since that time, and the efficiency increased, hence the above ratios are much greater to-day, since the other motors have not changed to the same extent.

The windmill must be ready to run night and day for a succession of years. It should therefore be of durable material and of the best workmanship; steel is being used more and more. The capacity should also be ample to accomplish the work designed; it is vexatious and a loss of time to be hindered for want of capacity. The commercial efficiency is enhanced by the life of the mill, hence a low first cost, if at the expense of workmanship or cheap material, may be a poor investment. In many cases it is also enhanced by storing power by pumping water into tanks or reservoirs, or charging electrical storage batteries for future use. DE VOLSON WOOD.

Windom, WILLIAM: cabinet officer; b. in Belmont co., O., May 10, 1827; studied law, and began the practice of his profession in Ohio; removed to Minnesota in 1855; member of Congress 1858–68; appointed U. S. Senator July, 1870, to fill a vacancy, and elected Senator for 1871–77; re-elected in 1876; was U. S. Secretary of the Treasury Mar. 5, 1881, to Oct. 27, 1881; re-elected U. S. Senator Oct. 26, 1881, for term ending 1883; became U. S. Secretary of the Treasury Mar. 5, 1889. D. in New York, Jan. 29, 1891.

Windowpane: a name given on parts of the coast of North America to the flatfish *Pleuronectes maculatus*, on account of its thin, transparent body. It is closely related structurally to the turbot of Europe, but is without economic value. J. S. K.

Windpipe: See TRACHEA.

Winds [O. Eng. *wind*: Germ. *wind*: Goth. *winds*; cf. Lat. *ventus*: Sanskr. *vāta-*, from root *vā-*, to blow]: air-currents. Winds are defined by their direction and velocity. The velocity is measured by the ANEMOMETER (*q. v.*), and expressed in miles per hour or meters per second. The greatest velocities attained can be judged only by their effects, as no human structures withstand them; they occur in tornadoes and hurricanes, and have been estimated at 200 or more miles per hour. For estimate by observers without anemometers the following scale is in use by the weather bureau:

NAME.	Miles per hour.	Apparent effect.
Calm	0	No visible horizontal motion to inanimate matter.
Light	1 to 2	Causes smoke to move from the vertical.
Gentle	3 to 5	Moves leaves of trees.
Fresh	6 to 14	Moves small branches of trees and blows up dust.
Brisk	15 to 24	Good sailing breeze and makes white caps.
High	25 to 39	Sways trees and breaks small branches.
Gale	40 to 59	Dangerous for sailing vessels.
Storm	60 to 79	Prostrates exposed trees and frail houses.
Hurricane .	80 or more.	Prostrates everything.

Many other scales have been adopted. The best known and the one usually employed at sea is the Beaufort scale, as follows:

Wind force, Beaufort scale.	Common name.	Velocity, miles per hour.
0	Calm	0
1	Light air	3
2	Light breeze	13
3	Gentle breeze	18
4	Moderate breeze	23
5	Fresh breeze	28
6	Strong breeze	34
7	Moderate gale	40
8	Fresh gale	48
9	Strong gale	56
10	Whole gale	65
11	Storm	75
12	Hurricane	90

The velocity of the wind increases as we ascend in the free air, and reaches a maximum at some height unknown, but not great. The decrease of velocity below this plane of maximum is due to friction on the earth's surface, and above the plane to the rarity of the air. Irregularities of the

earth's surface also introduce inequalities in the velocity, which are of so short duration that our ordinary sensations and instruments do not betray them. They have been studied especially by S. P. Langley, whose results are given in a paper entitled *Internal Work of the Wind* (Smithsonian *Contributions to Knowledge*, No. 884, 1893). These variations within a moving mass of air appear to play an important part in the flight of birds, especially the soaring.

The air when in motion exerts a pressure on obstacles opposed to it which is in the ratio of the area vertical to the direction of the wind, but is much modified by cushions of still air on the exposed surface, by eddies at the margins, etc., due to the physical properties of air. The pressure increases as the square of the velocity. For velocities up to 90 miles per hour, the pressures given by experiment are as follows, where the barometer stands at about 30 inches:

TABLE OF WIND PRESSURES (POUNDS PER SQUARE FOOT).

Indicated velocity.	+ 0.	+ 1.	+ 2.	+ 3.	+ 4.	+ 5.	+ 6.	+ 7.	+ 8.	+ 9.
0..	.....	.....	.....	.....	.....	0·104	0·144	0·190	0·243	0·303
10..	0·369	0·433	0·511	0·586	0·666	0·762	0·853	0·949	1·05	1·16
20..	1·27	1·38	1·50	1·63	1·76	1·90	2·04	2·19	2·34	2·48
30..	2·64	2·81	2·98	3·14	3·32	3·50	3·67	3·87	4·04	4·24
40..	4·44	4·64	4·84	5·07	5·27	5·51	5·72	5·93	6·18	6·40
50..	6·66	6·89	7·12	7·40	7·64	7·88	8·14	8·43	8·69	8·95
60..	9·22	9·49	9·76	10·1	10·4	10·6	10·9	11·2	11·6	11·9
70..	12·2	12·5	12·8	13·1	13·5	13·8	14·1	14·4	14·8	15·1
80..	15·5	15·8	16·2	16·5	16·9	17·3	17·6	18·0	18·4	18·8
90..	19·2	.....	.....	.....	.....	.....	.....	.....	.....	.....

The velocities indicated are those of the Robinson anemometer. These pressures are notably lower than those usually given, and are most reliable for velocities below 60 miles.

The direction is determined by the wind-vane or anemoscope. In horizontal directions the wind is named by that from which it comes. Thus a north wind is southward bound. The vertical motions of the air—upward or downward—have been but little observed. This is due to the position of the observer, who is tied to the bottom of the aërial ocean whose vertical currents are to be observed. He therefore occupies the most unfavorable position possible for their observation. Our knowledge of vertical currents is chiefly hypothetical, and is confirmed by cloud formation or other results of such motions.

Air-currents are the efforts of the air to restore the atmospheric equilibrium where it has been disturbed. If the earth were smooth and homogeneous, if it did not rotate, and there were no sun, the atmosphere would settle eventually into a state of equilibrium, in which there would be no air-currents. If now the sun should pour its rays on such an earth, the spot immediately beneath the sun would become warmer, the warmer air would rise and flow out above, colder air flow in below, and one regular vortex would be set up. If now the earth should rotate, this vortex would be spread along the whole equator, and would form a ring of ascending air with an inpouring layer below and an outpouring one above. Moreover, the rotation of the earth would give a twist to westward for the inflowing and to eastward for the outflowing air. Now, if to these are added irregularities of surface, irregularities in the distribution, formation, and dissipation of cloudiness, and seasonal and diurnal changes, sufficient causes have been found for the variability of winds. As results we have the general circulation of air over the globe, and the modifications of this by a great variety of special winds.

General Circulation.—If the earth were covered with water the general circulation, as determined by William Ferrel, would be that shown in Fig. 1, where the horizontal flow is shown on the sphere and the vertical section at its margin. The broken arrows represent the upper winds. This would consist of—

1. An equatorial ring with calm or light variable winds at the surface. This is the doldrums, and over it the air is ascending.

2. On each side of this are the trade winds, inflowing air at the surface, N. E. in the northern hemisphere, S. E. in the southern; also the westerly antitrades at some elevation. The trades are experienced over a band about 20° wide on the ocean. The stratum of air in motion is shallow, and does not generally extend far on shore. The antitrades are found on the tops of high mountains in the tropics.

3. Outside the trades a band in which, though the weather is settled, the wind is controlled by local instead of general terrestrial conditions. In this band lie the great stationary high pressures of the world.

4. The temperate regions or zones of variable weather and wind where the prevailing direction is westerly, S. W. below, W. above.

FIG. 1.—General circulation.

5. The polar regions, generally calm, but frequently disturbed by storms.

The equatorial belt moves alternately N. and S. with the changing declination of the sun, completing its movements in a year and causing a corresponding change in the zones mentioned above.

The phenomena following the great KRAKATOA (*q. v.*) eruption indicate that above the system of winds described there is a rapid easterly wind over the equator, changing to S. E. and N. E. as the latitude increases N. and S. respectively.

As an object of registry the wind is a complex quantity, having two elements of different sorts—viz., velocity and direction. The averages for climatic tables are either very voluminous as objects of record or so artificial as to be of little popular use. In the first case they are recorded separately for direction and velocity or for various combinations of these. Or they may be graphically represented by a diagram constructed like a mariner's compass and called a wind-rose.

By giving to the radius representing each wind a length proportional to the length of time and the velocity with which it has blown at a given place during a stated period, such as a year or a month, a wind-rose may be traced which will present at a glance the peculiar condition of this important element of climate at that place. In Fig. 2 the

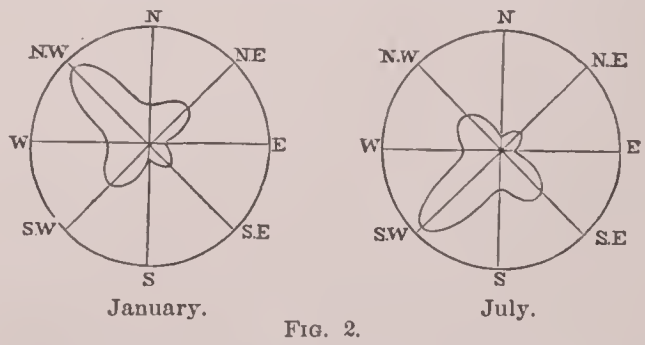


FIG. 2.

two diagrams, for instance, which represent in this way the average duration of winds in January and July in Maryland, the eye seizes at once the great prevalence of the northwesterly winds in winter and of the southwesterly in summer which is characteristic of the climate of the Atlantic coast. Prof. Heinrich Dove, of Berlin, used a similar method for showing graphically the average condition of the barometric pressure, thermometer, and hygrometer which accompanies the different winds, and calls such diagrams the barometric, thermic, and atmic (hygrometric) wind-roses of the places considered.

In the second case the directions alone, each occurrence counted as one, or the direction, each with its proper velocity, are combined to form a resultant by the principles of

the composition and resolution of forces given in text-books on physics. For this purpose a traverse table may be used. The resultant derived in this way is of little use except in certain technical inquiries, and gives no clear idea of the succession of winds. See Ferrel, *A Popular Treatise on Winds*; also articles CLIMATE, GEOLOGY, and METEOROLOGY.
MARK W. HARRINGTON.

Windsor: town of England, in Berkshire; on the right bank of the Thames; 21 miles W. by S. of London by rail (see map of England, ref. 12–J). The river is crossed here by an elegant iron bridge connecting Windsor with Eton. Windsor is an ancient borough, but has undergone much alteration of late years, owing to the improvement of the castle. (See WINDSOR CASTLE.) The park is next to the castle the most interesting feature of the place. Together with the immediately adjoining forest, it comprises an area of 13,000 acres. It still contains many historic trees, such as Elizabeth's Oak, Shakspeare's Oak, also the Long Walk, laid out in the reign of Charles II., Queen Anne's Ride of Elms, 3 miles long, etc. The oldest planted timber in England, dating back to the time of Elizabeth, is also found in Windsor Park, and not a few oaks may be pointed out of which the age is well established to be more than 1,000 years. Pop. (1891) 12,327. The parliamentary borough returns one member. R. A. R.

Windsor: town and port of entry; Hants co., Nova Scotia, Canada; on the Avon river, and the Dominion Atlantic Railway; 45 miles N. W. of Halifax (for location, see map of Quebec, etc., ref. 2–B). It is in a region abounding in limestone, gypsum, and other minerals; is the seat of Kings College, University of Windsor; and is principally engaged in ship-building, fruit-growing, and the manufacture of cotton, iron, and wooden goods. It has 2 weekly and 2 monthly periodicals. Pop. (1881) 2,559; (1891) 2,838.

Windsor: town and port of entry; Essex co., Ontario, Canada; on the Detroit river, and the Mich. Cent., the Grand Trunk, and the Canadian Pac. railways; opposite Detroit, Mich., and 110 miles S. W. of London (for location, see map of Ontario, ref. 6–A). It is regularly laid out and substantially built; has a large export trade in salt, fruit, and agricultural products; and is principally engaged in brewing and distilling liquors, and the manufacture of tobacco, cigars, leather, boots and shoes, carriages, etc. It has a daily and three weekly newspapers. Pop. (1881) 6,561; (1891) 10,322.

Windsor: town (settled in 1635; first house built in 1633; named in 1637); Hartford co., Conn.; on the Connecticut and Farmington rivers, and the N. Y., N. H. and Hartford Railroad (for location, see map of Connecticut, ref. 7–H). It contains several villages; has post-offices at Windsor, Poquonock, and Rainbow, and railway stations at Windsor, Wilson's, and Hayden's; and is principally engaged in agriculture, and fruit, vegetable, and tobacco growing. There are 7 churches—Congregational, 2; Roman Catholic, 2; and Methodist Episcopal, Protestant Episcopal, and Baptist, 1 each, and 2 mission chapels; a town high school, 2 kindergartens, public schools in 10 districts, and a young ladies' institute; public library; 2 town-halls; Moore's Park, with a half-mile racing-track, where the Windsor Agricultural Society holds annual fairs; and a trolley line connecting the town with Poquonock, Rainbow, and Hartford. Among the industrial plants are a creamery, canning-works, and manufactories of electrical goods, machine screws, tobacco, worsted goods, underwear, and paper. The banking business of the town is done in Hartford. The assessed valuation of property in 1894 was $1,375,787, and the town debt $61,200, chiefly incurred for macadamizing the roads. Pop. (1890) 2,954; (1900) 3,614. The history of the town extends back more than 250 years. The leader of its first settlers was Roger Ludlow, "the father of Connecticut jurisprudence." He is believed to have been the author of the constitution adopted in 1639 by the towns of Windsor, Hartford, and Wethersfield, which united to form the commonwealth of Connecticut. This was the first written constitution in the world, and the model afterward followed in drawing up the Constitution of the U. S., in which the Connecticut delegates exerted great influence. His only monument in Windsor is the "Roger Ludlow School," a modern brick edifice erected in 1893 not far from where he lived. Capt. John Mason, the conqueror of the Pequot Indians, was a Windsor citizen; and so was Oliver Ellsworth, Chief Justice of the U. S, whose home is still standing, and contains many colonial relics of great interest. His body lies in the old cemetery, and near him the Rev. Ephraim Hewit, one of the early pastors of the First Congregational Church, whose tombstone, dated 1644, is probably the oldest in New England. Gov. Roger Wolcott is also buried here, and many others bearing the distinguished names of Mather, Allyn, Rowland, Sill, Loomis, Pierson, Hayden, Morgan, Phelps, etc. See *Ancient Windsor* (revised edition), by Henry S. Stiles, M. D., and the *Memorial History of Hartford County*.
Rev. F. W. HARRIMAN.

Windsor: city (founded in 1856); Henry co., Mo.; on the Mo., Kan. and Tex. Railway; 21 miles S. W. of Sedalia, 208 miles W. of St. Louis (for location, see map of Missouri, ref. 5–E). It is in an agricultural, stock-raising, and coal-mining region, and has 8 churches, a twelve-room public-school building, 2 State banks (combined capital, $70,000), and a semi-weekly and a weekly paper. Pop. (1880) 872; (1890) 1,427; (1900) 1,502. EDITOR OF "REVIEW."

Windsor: village; Windsor co., Vt.; on the Connecticut river, and the Cent. Vt. Railroad; 78 miles S. by E. of Montpelier, the State capital (for location, see map of Vermont, ref. 7–C). It is in an agricultural region, is an important market for general produce, cattle, poultry, and maple-sugar; and has 6 churches, the State prison, 2 public parks, library (founded in 1882), high school, iron-foundry, machine-shop, manufactories of hardware specialties, lumber, and shoes, a savings-bank, and a weekly paper. Pop. (1890) 1,384; (1900) 1,656. EDITOR OF "VERMONT JOURNAL."

Windsor Castle: the principal royal residence of the sovereigns of Great Britain since the accession of George III. and frequently occupied by the earlier kings. It is built upon a chalk hill near the river Thames, about 22 miles from London. The older palace of the English kings was at Old Windsor, about 2 miles distant, and considerable doubt seems to exist among antiquaries and historians as to the first English king who built solid work of masonry at Windsor Castle. The most ancient portions are the Garter and Cæsar towers, the latter of which forms a bastion of the castle-wall, and abuts upon the winding street called Thames Street. It is one of the most curious antiquities in the whole building. These towers were erected in the reigns of Henry I., II., and III. To the same period belong the south ambulatory of the Dean's Cloister, a door behind the altar in St. George's chapel, and the remains of Domus Regis in the north of the chapel. The Norman gateway near the keep, the groining of the Devil's Tower and King John's Tower, and the Dean's Cloister pertain to the time of Edward III. St. George's chapel was built by Edward IV.; the choir roof by Henry VII.; the outer gateway of the lower ward by Henry VIII.; and the buildings from the Norman gate to the state apartments, including the library, were raised by Queen Elizabeth. But the castle, as it now appears, is almost entirely the creation of George IV.'s reign, when about a million sterling was spent upon the place. The courts, the terrace, the gardens, the slopes, and the parks, all underwent great change and much improvement. The internal changes are even more striking than the external. Suites of rooms decorated and furnished with the utmost magnificence, the corridor which runs round two sides of the quadrangle, and the grand staircases, immensely surpass what was previously to be seen in the castle. Changes have been made in the pictures, some of the old ones having been sent away and others introduced; a museum of curiosities has been arranged in a small gallery on the north side; the library has been improved; the plate-closet, containing silver and silver-gilt services, the engravings, the miniatures, and the drawings are of great value; and the collection of porcelain in the long gallery is thought to be unequaled in Europe; but no facilities are afforded for the study of the works of art in the castle, even when they are national property. The Wolsey chapel contains the tombs of Prince Leopold, Duke of Albany, and the Duke of Clarence. It has been magnificently decorated and contains a cenotaph to the Prince Consort.
Revised by RUSSELL STURGIS.

Windsor Locks: town; Hartford co., Conn.; on the Connecticut river, and the N. Y., N. H. and Hart. Railroad; 12 miles N. of Hartford, 14 miles S. of Springfield, Mass. (for location, see map of Connecticut, ref. 7–H). It was set off from Windsor, the oldest town in the State, and incorporated in 1854, and has an area of 11 sq. miles. Good power for manufacturing is obtained from the Connecticut river by means of a canal. There are 4 large mills engaged in the manufacture of book, cover, plate, enameled, tissue, and

fine copying paper and bristol-boards; also manufactories of cotton warp, novelty yarn, and fancy weaving thread, underwear, paper machinery, Jordan engines, silk goods, rolled steel, school globes and apparatus, carpet-loom chains, rubber rolls, trucks, furniture, lathe-chucks, and iron-foundry products. The town has 4 churches—Orthodox Congregational, Protestant Episcopal, Methodist Episcopal, and Roman Catholic; a public graded school; a Roman Catholic parochial school; Memorial Hall (cost $33,000), presented by Charles E. Chaffee to J. H. Converse Post, 67, G. A. R.; a savings-bank; and a weekly newspaper. Pop. (1880) 2,332; (1890) 2,758; (1900) 2,997. EDITOR OF "JOURNAL."

Windthorst, *vint'hōrst*, LUDWIG: party leader; b. at Kaldenhof, near Osnabrück, Hanover, Nov. 17, 1812, studied law at Göttingen and Heidelberg; practiced as an advocate in his native city, and entered the lower house of the Hanoverian diet in 1849. As leader of the anti-Prussian, anti-constitutional party he became president of the house and Minister of Justice 1851–53, founding the bishopric of Osnabrück and surrounding the king with Roman Catholics. In 1862 he again became a minister, and forced Hanover into an alliance with Austria. After the annexation of Hanover by Prussia and the formation of the North German Confederacy he became the leader in the Prussian diet of the Hanoverian opposition, and after the proclamation of the German empire, the chief of the Ultramontanist party in the German Reichstag. The indefatigable adversary of Prince Bismarck, he fought against the prolongation of dictatorial rule in Alsace-Lorraine, the expulsion of the Jesuits, the introduction of civil marriage, the establishment of the so-called May laws, the issue of the anti-socialist laws, etc.; and though he suspended his opposition when the Holy See and the German Government came to a compromise, he demanded too important concessions as the price of clerical support, and on their rejection by the Government renewed his attacks. He was re-elected in 1890. D. in Berlin, Mar. 14, 1891.

Windward Islands: originally, the Caribbee islands, or Lesser Antilles; that portion of the West Indian archipelago which forms a north and south chain on the eastern side of the Caribbean Sea, from the Virgin islands to Trinidad. The name was given in allusion to the prevailing winds, which in this region blow almost constantly from the E. (See WEST INDIES.) Officially, the name is now restricted to a British colony, embracing the islands of GRENADA, the GRENADINES, ST. VINCENT, and ST. LUCIA (*qq. v.*). The capital and residence of the governor-general is St. George's, in Grenada. H. H. S.

Wind-work: See GEOLOGY.

Wine and Wine-making [*wine* is O. Eng. *wīn*, an early loan-word from Lat. *vinum*; cf. the *v* in the later loan-word *vin-* (*vinea*) in *vineyard*]: By wine is usually understood the fermented juice of the grape, although the name is occasionally applied also to fermented beverages derived from other fruits. Its preparation dates from the most ancient times. The wines of the ancients, however, were very generally modified by the addition of spices and other condiments to suit the taste of the consumers—a habit still largely prevalent among their descendants on the Mediterranean shores. The taste and demand for strictly pure wines are of comparatively modern date, and their prevalence accounts in part for the decline of the reputation of some of the wines, anciently most esteemed, of Italy, Greece, Asia Minor, and Persia. Wine-making is a complex and difficult art when the best possible results are to be achieved, and owes much to the progress of modern science.

Grapes to be used in wine-making should be fully ripe; when this is not the case, the juice is deficient in quantity as well as quality, poor in sugar, and rich in acids, and yields a wine deficient in aroma, of a "green" flavor. It is therefore generally necessary to gather the fruit in two or three successive "pickings," leaving the unripe bunches time to mature. Should the natural conditions fail to bring about the full ripening, the defect is sought to be remedied by various devices, such as spreading the bunches on mats or straw in the sun or in warmed rooms; placing them in large vats, in mass, for several days; causing them to freeze, or steaming them moderately. When the weather permits, the grapes are often allowed to become over-ripe to such extent as to make them appear to be wilted; they then yield less, but sweeter and stronger wine (*Ausbruchwein*, Germ.). Finally, in southern countries (Spain, Italy, Greece) wine is frequently made from grapes fully dried, or raisins, the requisite water being added in crushing and pressing. In vineyards whose product is very valuable, all unripe and decayed berries are carefully handpicked from the bunches, and the latter, or even their berries, assorted as to quality. Where the vineyards are exposed to dust, the fruit is washed by spraying with clean water, since otherwise the wine acquires an "earthy" flavor, which is often erroneously ascribed to the inherent quality of the soil.

Stemming and Crushing.—According to the kind and quality of the wine to be made, the separation of the stems from the berries prior to crushing and fermentation may or may not be desirable, the stems containing much acid and tannin. It is sometimes done by handpicking, but mostly by means of coarse wire sieves or combs, against which the bunches are worked by hand. In California mechanical stemmers and crushers, driven by steam power and capable of working 10 tons of grapes per hour, are in use. The berries are mostly crushed by passing them between ribbed rollers, set so as to avoid crushing any kernels. Sometimes the unstemmed bunches are crushed by treading with clogs or sandals, or by pounding with wooden pestles. The "first run," or juice flowing off spontaneously after crushing, is often kept apart, because of yielding a higher quality of wine.

Pressing.—This is effected by means of presses of every variety of pattern, from the primitive lever and wedge press to the screw and hydraulic, and even the centrifugal process has been successfully used. When the "first run" has been separately received, the pressed juice constitutes the "second run"; while the pressed residue is the pomace, which is thereafter utilized for the production of inferior wine, vinegar, or brandy. The amount of unfermented juice obtained usually ranges from 70 to 80 per cent. of the weight of the berries in the wine grapes proper, which are juicy, with little pulp; while pulpy varieties (mostly used for the table) may yield as little as 60 per cent. But when, as in red-wine making, the pulp is fermented with the juice before pressing, the pomace (skins, pulp, and seeds) may amount to only 7 per cent. of the weight of the bunches, while the stems range from 2½ to over 7 per cent. of the same. The average product of salable red wine per ton of grapes is usually estimated at 150 gal.

Composition of Grapes and Must.—The grape-berries vary considerably in their contents of soluble matters, according to variety and degree of ripeness; viz., from 12·6 per cent. in colder climates to over 28 per cent. in warm regions; insoluble matters from 2·5 to 7 per cent.; water from 70 to 85 per cent. The ash of grapes varies from ·4 to ·5 per cent., of which from one-half to two-thirds is soluble in water. The ash of must varies from ·25 to ·4 per cent. of its weight; from 80 to 85 per cent. of this ash consists of alkali (chiefly potash); P_2O_5, about 4·1.

The proximate ingredients of must may be briefly stated as follows: Water; sugar, in the form of about equal parts of grape-sugar or dextrose, and fruit-sugar or levulose; a little gum and dextrin and pectin; vegetable acids—chiefly tartaric (sometimes racemic), small amounts of malic, citric; fat, wax; albuminoids; tannin; coloring-matter; volatile aroma, pre-existing chiefly in the husks of some kinds of grapes, and distinct from the wine flavor and "bouquet"; ash ingredient—potash, soda, lime, magnesia, oxides of iron and manganese, potassium sulphate, calcium phosphate, chlorine, silica. Potassium is chiefly present as bitartrate, or cream of tartar.

Sugar may be considered the most important ingredient of must, its amount, together with that of the vegetable acids, being largely the index to the probable commercial value of the product. Of all known fruit-juices, grape-must contains the largest amount of sugar, ranging from 13 to over 30 per cent., according to the warmth of the climate or season. From 20 to 25 per cent. is considered a desirable figure for dry wines. In fermentation the sugar is partially or wholly transformed into somewhat less than half its weight of alcohol, about one-half being given off in the shape of carbon dioxide (carbonic acid). Besides common alcohol, there are formed succinic acid, glycerin, and a number of aromatic ethereal compounds, whose presence and quantity materially influence the quality of the wine. Since, moreover, a liquid containing over 12·5 weight per cent. of alcohol ferments slowly or not at all, any excess of sugar of over 25 per cent. may remain undecomposed and sweeten the wine. Wines containing less than 12 per cent. of alcohol seem to owe any sweetness chiefly to glycerin produced in fermentation. The amount of sugar in the must is usually ascertained by means of a hydrometer.

The following table gives the volume-percentage of alcohol contained in some of the best-known wines, varying greatly, of course, from year to year:

Rhenish and Moselle wines	9·1 to 12·0
Grüneberger, Naumburger (Northeast Germany)	6·5
Burgundy, red	7·5 to 13·5
Bordeaux, first class	7·0 to 11·5
Catawba, Concord, etc	8·5 to 12·7
California wines	10·5 to 15·0
Port	18·0 to 23·0
Sherry	17·0 to 21·0
Madeira	17·0 to 19·0
Tokay	12·0 to 20·0
Greek and Syrian wines	14·0 to 18·0

The *acids* of must rank next in importance to sugar. Their amount varies from ·3 to 1·02 per cent., to a certain extent in inverse ratio to the sugar present, since during the later stages of ripening the free acids undergo a rapid diminution; and as on their presence depends, to a large extent, the formation of the peculiar ethereal wine-flavors in fermentation, one cause of the lack of flavor observed in wines of southern countries is obvious. From ·6 to ·8 per cent. are usual and desirable proportions of acid in musts; but more does not necessarily render the resulting wine more acid, provided abundance of sugar is present.

Of the special nature of the *albuminoids* and other nitrogenous ingredients of must but little is known. Their amount varies from ·24 to ·83 per cent., and their presence exerts a most important influence upon the fermentation and keeping qualities of wine. Being essential to the formation of yeast, an inadequate supply of these substances causes incomplete fermentation; while an over-supply, though partially precipitated in the lees, is supposed to render the wine liable to spoiling. This assumption is not, however, confirmed by the latest researches.

Tannin is not present in the pure juice, but occurs largely in the skins of some kinds of grapes (red and black) as well as in the stems and seedcoats. Hence close crushing and pressing, and still more the presence of the whole pomace during fermentation, cause the wine to be rich in tannin. Under the same circumstances the coloring-matter of the husks and the acid and tannin of the stems and seed-hulls find their way into the wine in larger quantities, thus causing the more acid and astringent qualities of red wine.

The *fermentation* by which must becomes wine starts spontaneously, under the influence of minute germs adherent to the outside of the berries or afloat in the air, within a time varying, according to temperature, from a few hours to several days after pressing. The must becomes increasingly turbid, gas-bubbles begin to rise, and soon bring with them particles of yeast (see FERMENTATION), which tend to accumulate on the surface. At the same time the temperature begins to rise, reaching 10° to over 20° C. above the outside temperature, according to that temperature and the quantity of the fermenting mass. Fermentation is usually most active between 25° and 30° C., depending somewhat upon the sugar-content of the juice; but wines fermented at high temperatures lack aroma and keeping qualities; hence the use of deep, cool cellars to retard the process and permit the formation of the delicate "bouquets" which characterize the wines of cool climates. Of late, the controlling of the temperature by artificial means, and the starting of the fermentation by means of pure yeast from superior vintages, are attracting increased attention.

In the making of red wines, dark-tinted grapes are crushed and fermented as a whole, with the must, usually in open tanks; thus charging the wine with the color, tannin, and other soluble matters of the grape body; while white wines are made by fermenting alone the previously pressed juice of white or light-colored grapes. This difference in preparation results, of course, in material differences in hygienic as well as other properties. Five to seven days is the usual time for red-wine mashes to complete their first fermentation; the gas carries the pomace to the top, forming the "cap" (Fr. *chapeau*), which is either submerged by stirring-in (Fr. *foulage*) at least once a day, or may be kept permanently submerged by perforated covers, to favor extraction and the contact of the yeast with the must. To prevent more certainly souring (acetification) by exposure to the air, a solid "floating" cover, leaving an annular space around its circumference for escape of gas, is advantageously employed. Of late, the complete exclusion of air during red-wine fermentation by various devices is coming into greater favor, and is applied even to the "grand wines" of France. In the fermentation of white musts the accumulation of the yeast at the surface and (in the usual practice) its expulsion at the bung-hole of the fermenting cask retards the action, approximately doubling the times above mentioned. Sandbags on the bung-hole are frequently used to prevent injurious access of air when the fermentation subsides.

After-fermentation.—Upon the subsidence of the violent fermentation, the yeast, with more or less of tartar, gummy and albuminoid matters (*lees*) and grape *débris*, and pomace, settles to the bottom, while the liquid clears and is then carefully drawn off into casks to undergo the after-fermentation, during which the remaining sugar (½ to 2 per cent.) ferments out slowly, and the formation of the characteristic bouquet begins. Great care must now be taken to prevent access of air and consequent acetification, yet without incurring the risk of bursting the casks by tight bunging. Hence, as the wine diminishes by evaporation through the wood, the empty space must be filled up with other wine (*ullage*), a practice which must thereafter be continued so long as the wine remains in wood. The after-fermentation may last from six weeks to several months; during that time an abundant deposition of lees takes place; these consist largely of tartar (which is difficultly soluble in alcoholic fluids) with some yeast, and gummy and albuminous matters, and are utilized in the manufacture of cream of tartar.

Maturing.—When fermentation has completely ceased the young wine is again drawn (*racked*) off, preferably into smaller casks, in which the maturing or aging is to take place. This process depends essentially on the gradual action of atmospheric oxygen, which enters through the pores of the wood, for in air-tight vessels no bouquet is formed. The maturing process is hastened by frequent racking (every two months), during which the wine is for a short time exposed to the air and absorbs oxygen. Each time this is done the wine becomes slightly turbid ("muddy") and forms a deposit, consisting mainly of products of oxidation, but very commonly in part of fungus vegetation. The suppression of the latter is of capital importance to the preservation of the wine, upon which it feeds, causing a variety of "diseases," which often cause enormous losses. According to circumstances and the nature of the germs present, the wine may incline to turn sour, forming vinegar, or "milksour," with a taste of rancid butter; or bitter, from the bitter ferment that particularly infests old wines; or stale, from the destruction of both tartar and alcohol by a special parasite, etc. Many remedies (mostly antiseptics) have been of old resorted to against these dangers. Among them sulphuring (by burning sulphur in the casks) to kill the germs; fining (adding gelatin and then, in the case of white wines, tannin, thus forming a bulky precipitate); and filtration are the most used; the last named, when employing close-textured unglazed porcelain (*Chamberland*) filters, is very effective. But the most ready remedy is the heating, out of contact with air, to about 65° C., as recommended by Pasteur, which can be done without injury to most wines, while killing the noxious germs and increasing the apparent age.

When, finally, after the lapse of from two to four, and in rare cases even eight years, the wine remains clear when racked, it is "bottle-ripe," and is considered finished. Most wines, however, continue to improve by age in flavor, for a length of time differing for each kind. In the end, even bottled wines become too harsh and acid to be palatable.

Sparkling Wines.—Ordinary "still" wines retain only so much of the gas generated in fermentation as to impart to them a refreshing quality, which soon vanishes on exposure to the air; the wine then becomes "flat." Sparkling wines, of which champagne (so called from the province of France where it is chiefly made) is the type, effervesce on account of an excess of carbonic acid gas contained in them under pressure. This gas is generated in a second fermentation produced in the young wine, subsequent to after-fermentation, by the addition of sugar and (when necessary) yeast-forming matter (gelatin). This is effected in strong bottles tightly corked, and when the fermentation is completed the sediment of yeast is ejected from the mouth of the inverted bottle by dexterous manipulation. Of all wines, champagne is perhaps the most extensively imitated, mostly by forcing into sweetened still wines, or even cider, such gas as is used in the preparation of soda-water.

Sweet or fortified wines are made from certain grapes of high sugar-contents, grown in warm countries, by arresting

the fermentation of the must by the addition of wine-brandy before the sugar has fermented out, and subsequent exposure of the wine thus "fortified" to air at summer heat in partially empty casks, whereby it is matured. Such wines are often sweetened to suit the taste by means of evaporated must; they contain usually from 2 to 8 per cent. of sugar.

Blending of Wines.—Few wines reach the consumer as they would result from the processes above detailed, as applied to one kind of grape. It is the general practice to adapt the various kinds and qualities of wines to the taste of the consumers by the intermixture of such as will improve each other. To this practice no reasonable objection can be made, since from beginning to end intelligent management influences the nature of wine nearly as much as its origin, and it would be difficult to define just what should be understood by "natural wine." Blending is a difficult art, requiring a natural qualification as well as trained judgment, but is greatly aided by chemical wine analysis.

"Doctoring" of Wines.—Of all articles of human consumption wine is probably the one most commonly modified by additions and adulterations. So long as these additions merely make up for deficiencies in what might be considered the normal composition of must (as is done in adding sugar to the must of vintages that have suffered from unfavorable weather), it is questionable whether the consumer has reason to complain; and hence this practice ("chaptalizing") is very general in the colder wine countries, and is hardly made a secret of. The simultaneous addition of water ("gallizing") might claim equal immunity when made on similar grounds, and not for the fraudulent increase of quantity. The manufacture of a wine-like beverage from the pomace, by extraction with sugar-water to such extent as will secure for the resulting juice a proportion of constituents similar to that of natural must ("petiotizing") while not intrinsically objectionable, is liable to great abuse, though vastly preferable to the compounding of so-called wines from materials to which the grape is a stranger, and whose manufacture has to a great extent been supplanted by that of cheap "petiotized" wines. The "piquette" made in France from the pomace by a second fermentation, forming the common beverage of the laboring class, falls under these heads. Aside from these more or less avowable practices (among which "scheelizing," the addition of glycerin, might also be mentioned), the dark arts of the wine-compounder are innumerable, and often difficult of detection.

Among still wines, those most commonly imitated are the heavy, sweet wines of southern countries, which are to a great extent themselves the result of a comparatively artificial process, and whose general wine-flavor it is relatively easy to reproduce. Raisins and other dried fruits are most commonly the basis of such articles.

Classification of Wines.—The wines of commerce may in a general way be divided into—(1) dry wines, not or at least not obviously sweet, but possessing a more or less distinctive and high flavor—bouquet; (2) sweet or "fortified" wines, permanently and decidedly sweet, and rich in alcohol, with but a general vinous aroma; mostly from southern climates. Between these two classes there are of course all degrees of transition, and in both we find both white and red or tinted wines. Those of France are classed with especial care for commercial purposes.

France stands at the head of wine-producing countries, and produces an especial abundance and variety of red wines, of which those most highly esteemed are grown in the Bordelais and in Burgundy, as well as in Dauphiné. The Bordeaux wines (clarets) have a full, agreeable bouquet, a good deal of body, are spirited yet not heady, with a decided astringency and acid, and permit of considerable dilution with water, with but little loss of zest; they form the bulk of French export wines; first-class are Château Lafitte, Château Latour, Château Margaux, Haut Brion, etc. Second-class clarets are, e. g., those of St.-Julien, St.-Estèphe, Cantenac of the Bordelais, those of the Champagne, the Lyonnais, and Dauphiné. The Burgundy wines, such as Chambertin, Clos Vougeot, etc., are rather heavy, oily, less astringent and acid, with a fine, peculiar aroma, and will not bear shipment to long distances. *Petits vins*, or *vin ordinaire*, is produced in all but eight out of eighty-six departments. The white wines of France are stronger and have more body than the Rhenish wines: first-class are the "Haut Sauterne" of Château Yquem, of the Bordelais; also some white wines of Burgundy and Champagne (Sillery). Other Sauternes, Barsac, etc., count as second-class. Superior dry wines are also produced in the south of France, but most prominent in commerce are the *liqueur* (sweet) wines of Perpignan, Languedoc (Frontignan, Lunel), Roussillon, and the "straw wines" of Dauphiné. In 1875 the wine yield of France was over 1,840,000,000 gal., in 1887, only 535,000,000 gal., owing to the phylloxera, in 1893, 1,300,000,000 gal., and in 1894, not much less than the last amount.

Foremost among the wines of Germany are the high-flavored, dry Rhenish wines, grown from Alsace down to Coblenz, in the valley of the Rhine and its tributaries. Of the white wines (known in England under the collective name of "hock," a corruption of Hochheim), those of Hochheim, Rüdesheim, Johannisberg, Forst, the Niersteiner, Marcobrunner; and among the red wines, the Affenthaler and Asmannshäuser are best known. The Moselle wines resemble those of the Rhine in flavor, but are light and acid; the wines of Franconia are also acid, but heavier, and not so high-flavored. Those of Northeastern Germany (Silesia, Saxony) are very acid.

Among the wines of Switzerland, those of the Jura region (Vaud, Neuchâtel, Geneva) are esteemed best. Almost all have a somewhat harsh and earthy taste, and are not exported. That of the Valtelline has some reputation as a stomachic and tonic.

Austria has usually been second to France in the amount of wine produced, but only the wines of Hungary and some of the liqueur wines of the Adriatic provinces are somewhat widely known in commerce, and the aggregate export is quite small. The sweet, fiery, and aromatic wine of Tokay in Hungary is by some esteemed above all others. Many other excellent wines are in high local repute.

Italy produces abundance of wines, which in the north (Piedmont, Tuscany) are chiefly "dry" reds, such as those of Asti, Monte Pulciano, and Fiascone, the Chianti, etc.; while southward, and especially in Sicily, Lachryma Christi and Marsala are best known. Much good material is spoiled by bad management in wine-making. During the worst period of the phylloxera invasion in France, Italy exceeded the latter country in wine production, and supplied much wine to it.

The wine production of the Iberian Peninsula is very extensive and of considerable commercial importance. Both dry and sweet wines are produced. Among the wines exported, the best known are those of Jerez (sherry), Malaga, and Oporto (port). The latter is largely made and blended to suit the English market. The wines of Malaga and Jerez are both of the dry and liqueur class; all are strengthened by the addition of spirit. Of the same general character are the wines of Madeira.

Few of the wines of Greece enjoy a general reputation at present, although the wines of Cyprus and Chios are still praised. They, as well as those of Turkey in Europe and Asia, and Persia, suffer for want of care in preparation, and from the nature of the vessels (goat or hog skins, rendered water-proof by pitch) in which they are too commonly kept or conveyed.

The wines of Southern Russia (Crimea and Bessarabia), though little known to commerce, are now supplying a considerable portion of the demand in that empire, and their production is increasing very rapidly.

In Africa (apart from the Canaries) wine-production has long been established in the Cape Colony, and the (mostly sweet) wines of the Cape enjoy some repute in England and elsewhere. In Algeria, the vine-culture early established by the French now produces a considerable amount of wine. The wines of Constantine enjoy some commercial reputation, but most of the Algerian wines disappear under the blending art of the mother country.

Recently the wines of Australia, resembling in general those of California, have appeared in the English market, and have met with favor. The wines of Chili and Argentina are not known to commerce as yet.

Of American wines, those of California approach most nearly to those of Europe, being made from the same varieties of grapes, of the *vinifera* type, which are unadapted to the climatic conditions E. of the Rocky Mountains. The variety of climates within California seems to render feasible, with proper selection and treatment, the production of all the various types of wines of Middle and Southern Europe. The best wines of California growth are unfortunately now commonly sold to consumers under various French labels, leaving mainly the inferior qualities credited to the State;

which, added to various unfortunate, but in their nature only temporary, commercial conditions, has caused a serious depression in the wine industry there. The high qualities of the best Californian wines, however, have been repeatedly recognized by French experts. The wine product of California has for a number of years ranged from 15,000,000 to 20,000,000 gal.

The wines of the States E. of the Rocky Mountains, made from American grapes only, differ from those of Europe and all other countries in mostly possessing more or less of the peculiar (foxy) aroma of the berries. As in Europe, the musts often fail to acquire, N. of the Potomac, the desirable amount of sugar; which is supplemented by the addition of cane-sugar, but would be more appropriately supplied from the surplus sugar of California musts, evaporated for the purpose. See WINE in the Appendix. E. W. HILGARD.

Wineberry: a term applied in the U. S. to *Rubus phœnicolasius*, a raspberry of Japan, introduced as a fruit-plant in 1887, although it was grown before that time as an ornamental plant. The plant is characterized by a hairy reddish covering, and the wine-red berries are inclosed in a husk-like calyx. The fruit is little known. L. H. B.

Wine'brenner, JOHN: religious leader; b. in Frederick co., Md., Mar. 24, 1797; became a minister of the German Reformed Church at Harrisburg, Pa., 1820, but in consequence of a difference of views in regard to revivals seceded from that Church Sept., 1828, and in Oct., 1830, established a new denomination under the title of the Church of God, now more generally known as "Winebrennerians." (See article CHURCH OF GOD.) Winebrenner edited for several years *The Gospel Publisher*, now the *Church Advocate*, the organ of his sect, published at Harrisburg, and published a number of books, including *Pronouncing Testament and Gazetteer* (Harrisburg, 1836); *Brief Views of the Church of God* (1840); *A Treatise on Regeneration* (1844); and *Practical and Doctrinal Sermons* (1860). D. at Harrisburg, Sept. 12, 1860.

Winebrennerians: See WINEBRENNER.

Wineland: See VINLAND.

Wine-plant: a name sometimes applied to RHUBARB (*q. v.*).

Winer, *vee'ner*, GEORG BENEDIKT: professor of theology; b. at Leipzig, Germany, Apr. 13, 1789; studied theology in his native city; became professor extraordinary there 1819, ordinary professor at Erlangen in 1823 and at Leipzig in 1832, and died there May 12, 1858. He published *Comparative Darstellung des Lehrbegriffs der verschiedenen Kirchenparteien* (Leipzig, 1824; 4th ed. by P. Ewald, 1882; translated into English, *The Doctrines and Confessions of Christendom*, Edinburgh, 1873); *A Grammar of the Chaldee Language as contained in the Bible and the Targums* (1824; Eng. trans. by H. B. Hackett, Andover 1845); and *A Grammar of New Testament Greek regarded as a sure Basis of New Testament Exegesis* (1822; 8th ed. 1894; translated into English by W. T. Moulton, Edinburgh, 1870; 2d ed. 1877); *Biblisches Realwörterbuch* (1820; 3d ed. 1847, 2 vols.), a work of great industry and learning upon all historical, geographical, and archæological matters contained in the Bible; *Handbuch der Theologischen Litteratur* (1821; 3d ed. 1838), also a very useful work, and distinguished as much by accuracy as by completeness. Revised by S. M. JACKSON.

Wines, ENOCH COBB, D. D., LL. D.: philanthropist; b. at Hanover, N. J., Feb. 17, 1806; graduated at Middlebury College 1827; took charge of the Edge Hill School, Princeton, N. J., 1833; became Professor of Languages in the Central High School at Philadelphia 1838; conducted a boarding-school at Burlington, N. J., 1844–48; was licensed as a Congregational preacher 1849; was pastor of churches at Cornwall, Vt., and Easthampton, Long Island; became Professor of Ancient Languages in Washington College, Pa., 1853, and president of the City University of St. Louis, Mo., 1859; secretary of the New York Prison Association 1862; founded the National Prison Association 1870, of which he became secretary; went to Europe as a representative of the U. S. Government 1871; succeeded in convening representatives of twenty-six governments at the first International Penitentiary Congress at London, July 4, 1872, when he was appointed chairman of a commission which met at Brussels 1874 and at Bruchsal 1875, and called a second international congress to meet at Stockholm 1877. He was the author of *Commentaries on the Laws of the Ancient Hebrews* (New York, 1852; 6th ed. Philadelphia, 1869) and *The State of Prisons and Child-saving Institutions throughout the World* (Cambridge, 1880). D. at Cambridge, Mass., Dec., 10, 1879. Revised by GEORGE P. FISHER.

Winfield: city (founded in 1870); capital of Cowley co., Kan.; on the Walnut river, and the Atch., Top. and S. Fé, the Mo. Pac., and the St. L. and San Fran. railways; 38 miles S. E. of Wichita (for location, see map of Kansas, ref. 8–H). It is the center of a rich agricultural region; is principally engaged in farming and manufacturing; contains churches of the leading denominations, a public high school, Methodist Episcopal and German Lutheran colleges, 3 national banks with combined capital of $225,000, and a State bank with capital of $20,000; and has a daily, 5 weekly, and 4 monthly periodicals. Pop. (1880) 2,844; (1890) 5,184; (1900) 5,554. EDITOR OF "COURIER."

Wingham: village; Huron County, Ontario, Canada; on the Maitland river, and the Gr. Trunk and Canadian Pac. railways; 39 miles W. of Palmerston (for location, see map of Ontario, ref. 4–C). It is in an agricultural and dairying region; derives excellent power from the river, and has saw and flour mills, salt-works, furniture and other factories, a bank, and two weekly newspapers. Pop. (1881) 1,918; (1891) 2,167.

Winkelried, *vink'el-reed*, ARNOLD, von: patriot; a native of the canton of Unterwalden, Switzerland. According to the legend, he decided by his patriotic self-sacrifice the battle of Sempach July 9, 1386, in which a small Swiss force was engaged with a large Austrian army under Archduke Leopold. By gathering the lances of Austrian halberdiers into his body and bearing them down to the ground, he effected a breach in the Austrian line, through which the Swiss made the attack. A monument was raised to him at Stanz, in Unterwalden, Sept. 3, 1865. The question of the truth of the legend has furnished the subject of an extensive literature. See H. von Liebenau, *Arnold von Winkelried, seine Zeit und seine That* (1862); Kleissner, *Die Quellen zur Sempacher Schlacht und die Winkelried Sage* (Göttingen, 1873); Bürkli, *Der wahre Winkelried—die Taktik der alten Urschweizer* (1886); and T. von Liebenau, *Die Schlacht bei Sempach*, etc.

Winlock, JOSEPH, LL. D.: astronomer; b. at Shelbyville, Ky., Feb. 6, 1826; graduated at Shelby College 1845; became Professor of Mathematics and Astronomy in that institution; was employed at the observatory at Cambridge, Mass., as one of the computers of the *Nautical Almanac* 1852; became Professor of Mathematics in the U. S. navy 1856; was the second superintendent of the *American Nautical Almanac*, succeeding Admiral C. H. Davis in 1856; was for a short time professor at the Naval Academy at Annapolis, Md.; became director of the observatory at Cambridge, Mass., and Phillips Professor of Astronomy in Harvard University 1866; conducted expeditions to Kentucky to observe the solar eclipse of Aug., 1869, and to Spain to observe that of Dec., 1870, and made important improvements in the equipment of the observatory. D. at Cambridge, June 11, 1875. Revised by SIMON NEWCOMB.

Winneba'go City: village; Faribault co., Minn.; on the Blue Earth river, and the Chi., Mil. and St. Paul and the Chi., St. P., Minn. and Om. railways; 35 miles S. of Mankato (for location, see map of Minnesota, ref. 11–E). It is in an agricultural region, and has water-works, a Freewill Baptist college, a high school, 2 private banks, and 2 weekly newspapers. Pop. (1880) 993; (1890) 1,108; (1900) 1,816. EDITOR OF "PRESS-NEWS."

Winnebago Indians: See SIOUAN INDIANS.

Winnebago Lake: the largest body of water entirely within the limits of Wisconsin; traversed by the navigable Fox river. It is 26 miles long, and has a maximum breadth of 10 miles. Area, 212 sq. miles. As shown by railway surveys, it is 748 feet above the sea. It is navigated by steamboats, and abounds in fish of various species. A part of its eastern shore has been curiously walled with stones that have been forced shoreward by the expansion of the ice in winter. Revised by I. C. RUSSELL.

Winnemuc'ca: town; capital of Humboldt co., Nev.; on the Humboldt river, and the South. Pac. Co.'s railway; 144 miles W. of Elko, 170 miles N. E. of Reno (for location, see map of Nevada, ref. 3–G). It is in an agricultural and silver-mining region, is a shipping-point for beef, wool, and grain, and has a national bank with capital of $110,000, and a daily newspaper. Pop. (1880) 763; (1890) 1,037; precinct (1900) 1,110. SILVER STATE PUBLISHING CO.

Winnemucca Lake: a body of water occupying a desert valley in Western Nevada. It is 26 miles long from N. to S. with an average breadth of 3½ miles, and is from 50 to 87 feet deep. It is fed almost entirely by Truckee river, which divides and supplies Pyramid Lake also. It is without outlet, and contains 3·6 parts per 1,000 of mineral matter, principally common salt, in solution. ISRAEL C. RUSSELL.

Winnepegoo'sis: the Indian name for Little Lake Winnipeg, a continuation of Lake Manitoba, lying from 30 to 60 miles W. of Lake Winnipeg, into which it discharges through the Fauford and Little Saskatchewan rivers. It is surrounded by wooded prairie land not yet settled.

Win'nipeg: capital of the province of Manitoba, Dominion of Canada; the largest city of the Dominion W. of Lake Superior, and the seventh in size in British North America; situated in 97° W. lon. and 49° 50′ N. lat.; at the junction of the Red and Assiniboine rivers (see map of Canada, ref. 9–H). Winnipeg covers an area of about 12,750 acres, a large part of which is not yet built upon. It is divided into six wards for municipal purposes, and its streets are laid out almost entirely on the rectangular system. Public squares, other than the spaces surrounding some of the public buildings, were not provided for, but a board of park commissioners purchased several open spaces in different parts of the city, which have been converted into public recreation-grounds.

Streets, Public Buildings, and Institutions.—The streets, stores, offices, and larger private houses are lighted by electricity, while gas is also used as an auxiliary or substitute. The street-car service is an electric one, and there are about 25 miles of line in use. Neither of the rivers has been used for commercial purposes by the city for several years, but a lock is now building to overcome an obstruction 18 miles down the Red river, when that stream will be navigable from Winnipeg to Lake Winnipeg, and for its whole distance in the province, and probably for a considerable distance in the U. S. The Assiniboine is a smaller and more sluggish stream, on which are the old city water-works. A new artesian well system now provides the water-supply of Winnipeg. The city is partially paved, asphalt, macadam, and cedar blocks being used for the roadway, and where wooden sidewalks have been abandoned, granolithic pavement has taken their place. Main Street, running N. and S. from the Assiniboine to the northern limit of the city and parallel with Red river, and Portage Avenue, running east and west, are the principal business streets, though most of the wholesale houses are on Princess Street and its immediate vicinity.

The city-hall and the post-office, both on Main Street, together with the legislative buildings, lieutenant-governor's residence, court-house, the university building, and armory —these latter in the southern or Assiniboine side of the city—are the principal public buildings. There is an Anglican cathedral and archbishop's residence at the northern extremity of the city, and 5 other edifices belonging to the Church of England, 7 Presbyterian churches, 6 Methodist, 2 Baptist, 4 (including the cathedral) Roman Catholic, the Roman Catholic cathedral being in St. Boniface, a suburb on the east side of Red river. St. John's College, for Anglicans, the Methodist College, the Presbyterian College, and the Roman Catholic College at St. Boniface comprise the Manitoba University, and there are 12 large public schools. The Winnipeg General Hospital and the St. Boniface Hospital are supported by voluntary, private, and denominational subscriptions with government aid. The Deaf and Dumb Institute is supported by the Provincial Government.

Finances.—Winnipeg is governed by a mayor elected by general vote, and a council of twelve elected by six wards, there being a separate organization of trustees for the government of the public schools, also elected by wards. The real estate of the city was assessed in 1901 at $22,361,650, and business-tax assessment $4,060,760, or in all $26,422,410, an increase of $1,344,959 over 1900, with a rate of 21·00 mills on the dollar, including the school assessment, which varies according to the necessity of building.

Industries, Banks, etc.—The city is not only the capital of the province, but is to a large extent the distributing point for the whole of the territory between Lake Superior and the Rocky Mountains. Large flour mills, linseed-oil mill, lumber-mills, foundries, and the Canadian Pacific and Canadian Northern Railway's shops, barbed-wire factories, a large abattoir, and a pork-packing establishment on the St. Boniface side of the Red river. All the leading banks of Canada have branches in Winnipeg, many having fine buildings, the city usually ranking third in the monthly return of banking business of the Dominion. There are, in addition, several mortgage and loan companies that advance money on real estate, and a private bank.

History.—Winnipeg was incorporated by act of the provincial Legislature in 1873. At the junction of the Red and Assiniboine rivers the Hudson Bay Company's post, Fort Garry, had drawn round it in course of time a small settlement of traders and retired employees of the company. In 1870, when the Red River expedition, under Col. (later Lord) Wolseley, arrived at Fort Garry to dispossess the insurgent Riel, there was a population of about 200 people within a mile of the fort. This served as the nucleus of the city of Winnipeg. (See MANITOBA.) The rush of people from other parts of Canada, consequent upon the opening up of the country and the decision of the Government to make the capital of the new province at Fort Garry, quickly determined the question of the future central point, and the population rapidly increased. When rail communication through Northern Minnesota was completed, the growth of the city continued more steadily, and was again largely augmented by the construction of the Canadian Pacific Railway and the boom which occurred in 1881 and 1882. The reaction from the boom was felt for a few years, but the settlement of the farming lands, the produce of which passed through Winnipeg, prevented any serious results from the over-speculation, and enabled the city to recover its steady growth. Eight lines and branch lines of railway converge in Winnipeg. Pop. (1881) 7,985; (1891) 25,642; (1896) 38,000; (1901) estimated, 47,500. Revised by W. F. PAYNE.

Winnipeg Lake: a large sheet of water situated in Manitoba, Canada, between lat. 50° and 54° N. and lon. 96° 30′ and 99° W. It is about 4 miles wide at its south end, narrows very closely in the center, and then extends for about 275 miles, expanding to about 60 miles at its northern extremity. It is the reservoir of a number of rivers, chief among which is the Winnipeg, draining the Lake of the Woods and country W. of the height of land that separates the waters flowing into Lake Superior from those of the west; the Great Saskatchewan, which with the Assiniboine, whose waters also fall into it, drains the Canadian Northwest territories Alberta, Saskatchewan, and Assiniboia; and the Red river, flowing between Minnesota and North Dakota and flowing through Manitoba. Lake Winnipeg discharges through the Nelson river into Hudson Bay. It is about 9,000 sq. miles in area, and 710 feet above the sea—that is, 112 feet higher than Lake Superior. It is rocky and rugged on its east coast, the Laurentian formation prevailing, but flat and marshy on much of the west, where the Silurian formation is found. At the head of the lake is Norway House, formerly one of the chief distributing ports of the Hudson Bay Company. There is a large Icelandic settlement on the west shore, back of which the country is fertile and wooded. The lake produces large quantities of whitefish, the fisheries being worked systematically as well as providing food for the Icelandic settlement and the Indians on neighboring reservations. There is a small trade between the lake and Selkirk in Manitoba, which will be considerably increased when the rapids of St. Andrews, on the Red river, half way between the lake and the city of Winnipeg, have been locked. MOLYNEUX ST. JOHN.

Winnipeg River: a river having its chief sources in the Lake of the Woods, which drains the Rainy River country, and in English river (300 miles long), flowing out of Lake Seul, besides other smaller streams. It is about 530 miles long, and runs through a rocky Laurentian country well wooded with spruce, some pines, tamarac, etc. It is rather a series of small lakes, connected by links flowing over rapids and falls, than a continuous stream. It is navigable by small boats and canoes, but not by steamers; the first rapids are quickly succeeded by others occurring within a few miles of the mouth. The boats and canoes of the Red River expedition, under Wolseley in 1870, reached Manitoba from Lake Superior by this river. There is a mission, and there are one or two Hudson Bay Company's posts on the river, and a few scattered settlers, but the country is not fitted for agriculture. MOLYNEUX ST. JOHN.

Winnipiseog'ee Lake: a body of water in east central New Hampshire. It is of irregular outline, and has an extreme length of 25 miles and a breadth varying from 1 to 10 miles. It is studded with picturesque islands, and is much visited in summer for its charming scenery. Area,

175 sq. miles: elevation, 472 feet. It discharges its clear waters by the Winnipiseogee river, one of the head streams of the Merrimack. Revised by I. C. Russell.

Winnsboro: city; capital of Fairfield co., S. C.; on the Southern Railway; 35 miles N. of Columbia (for location, see map of South Carolina, ref. 5–E). It is in an agricultural and stone-quarrying region; contains Mt. Zion Institute (chartered in 1777), a graded public school, a national bank with capital of $100,000, and an incorporated bank (capital, $81,400); and has a tri-weekly and a weekly newspaper. It was at one time the headquarters of Lord Cornwallis, and for a number of years all the cotton-gins in the U. S. were manufactured here. Pop. (1880) 1,500; (1890) 1,738; (1900) 1,765.
Editor of "News and Herald."

Wino'na: city (settled in 1851, city government organized in 1857); capital of Winona co., Minn.; on the Mississippi river, and the Burl. Route, the Chi. and N. W., the Chi., Mil. and St. P., the Green Bay, Win. and St. P., and the Win. and West. railways; 27 miles N. W. of La Crosse, Wis., 104 miles S. E. of St. Paul (for location, see map of Minnesota, ref. 11–H). It is on a plain between the river and Lake Winona, is surrounded by towering bluffs, including Sugar Loaf and Trempealeau Mountains, and is famed for its beautiful location and picturesque scenery. Two railway bridges and a wagon bridge span the river here. The city has improved water-works and sewerage, electric lights, electric street-railways, and several miles of paved streets. The noteworthy buildings include the U. S. Government building, erected in 1890 at a cost of $150,000; the State Normal School, built in 1868 and enlarged in 1894, cost $220,000; High-school building, erected in 1887 at a cost of $60,000; Winona Seminary for young ladies, cost $50,000; opera-house, erected in 1893 at a cost of $50,000; and the public library, with nearly 12,000 volumes. There are 23 churches, 10 public schools, 4 parochial schools, 2 watchmakers' and engravers' schools, and a business college; 2 national banks with combined capital of $425,000, 3 State banks, two of which had combined capital of $100,000; a private bank; and 2 daily, a semi-weekly, and 7 weekly newspapers. The city is an important market for grain and other products of this part of Minnesota and the neighboring part of Wisconsin, and has flour and lumber mills, wagon-factories, and agricultural-implement works. Pop. (1880) 10,208; (1890) 18,208; (1900) 19,714. William Codman.

Winona: town; capital of Montgomery co., Miss.; on the Ill. Cent. and the Southern railways; 23 miles S. of Grenada, 88 miles N. by E. of Jackson (for location, see map of Mississippi, ref. 5–G). It is an important cotton-shipping point, and has several cotton-gins and grist-mills, 2 State banks with combined capital of $100,000, and a weekly and a semi-monthly periodical. Pop. (1880) 1,204; (1890) 1,648; (1900) 2,455. Editor of "Times."

Winoos'ki: village; Colchester town, Chittenden co., Vt.; on the Cent. Vt. Railroad; 2 miles N. of Burlington, the county-seat (for location, see map of Vermont, ref. 4–A). It is in an agricultural region; has 4 churches, a graded public school, a savings-bank, electric railway to Burlington and to Fort Ethan Allen, and a weekly newspaper: and is engaged in the manufacture of cotton and woolen goods, iron and brass goods, lumber, carriages, window and door screens, and doors, sashes, and blinds. Pop. (1880) 2,833; (1890) 3,659; (1900) 3,783. Editor of "Journal."

Winooski (or **Onion**) **River**: a river that rises in Northeastern Vermont, flows westward through the Green Mountains, and empties into Lake Champlain at a point 5 miles N. W. of Burlington. It has numerous falls, including those at Middlesex and at Winooski, near Burlington; and in several places has cut deep gorges. It is a beautiful river, about 100 miles long. I. C. R.

Winslow, Edward: governor of Plymouth Colony; b. at Droitwich, Worcestershire, England, Oct. 19, 1595; joined the congregation of the Pilgrim church at Leyden 1617; married in Leyden; embarked in the Mayflower with his wife and his brother Gilbert 1620; was one of the party in the shallop which explored the coasts of Cape Cod and discovered the harbor of Plymouth; lost his wife during the first winter; married Mrs. Susannah White, theirs being the first marriage in New England. During troubles with the natives he offered himself as a hostage to Massasoit, and paid two visits to the residence of that chieftain two days' journey inland, curing him of a severe illness on the second occasion (1623), thereby gaining his confidence and assuring his friendship; wrote a narrative of his visit to the Indians, which appeared in George Morton's *Relation* (1622); made a voyage to England as agent of the colony 1623, returning with a supply of necessaries and the first cattle; was chosen a magistrate 1624; made a second voyage to England, returning 1625; was chosen governor 1633; went to England again 1635, when he appeared before the council and succeeded in disconcerting a plot for abolishing the self-government enjoyed by the colonists; was confined in the Fleet prison for seventeen weeks by order of Archbishop Laud, on complaint of Thomas Morton, for having at Plymouth taught in the church, being a layman, and having performed the ceremony of marriage as a magistrate; was again governor 1636, and a third time 1644; went to England for the last time 1649, when he was influential in the formation of the Society for Propagating the Gospel among the Indians of New England; remained in England during the Protectorate, being employed in several public capacities, and in 1655 was one of three commissioners sent by Cromwell to direct an expedition against the Spanish settlements in the West Indies. D. at sea of a fever, between Santo Domingo and Jamaica, May 8, 1655, and was buried at sea. A portrait, said to be by Vandyke, is preserved in Memorial Hall, Plymouth, where are also his chair and other relics. He was the author of *Good Newes from New England, or a True Relation of Things very Remarkable at the Plantation at Plimouth in N. England; together with a Relation of Customes among the Indians* (1624; given in full in Young's *Chronicles of the Pilgrim Fathers*, Boston, 1841); *Brief Narration, or Hypocrisie Unmasked, a True Relation of the Proceedings of the Governeur and Company of the Massachusetts against Samuel Gorton, etc.* (1646), re-issued as *The Danger of Tolerating Levellers in a Civill State, etc.* (1649; given in part in Young's *Chronicles*); *New England's Salamander, etc.* (1647); *The Glorious Progress of the Gospel amongst the Indians in New England, with Appendix* (1649); and *A Platform of Church Discipline in New England* (1653). Several of these have been republished by the Massachusetts Historical Society. An elaborate *Genealogy* of the descendants of Gov. Winslow and his brothers was prepared by Dr. David Parsons Holton and Frances K. Holton of New York (New York, 1877). Revised by S. M. Jackson.

Winslow, Forbes Benignus, D. C. L.: alienist; b. in London, England, in Aug., 1810; a descendant of the Massachusetts Winslows; went to the U. S. in early life; began the study of medicine at New York; graduated at the College of Surgeons, London, 1835; took his degree of M. D. at Aberdeen; began practice in London; was for some time parliamentary reporter for the *Times*; gave special attention to insanity; was Lettsomian lecturer to the Medical Society of London 1837; opened a private asylum at Sussex House, Hammersmith, and subsequently another in London; founded in 1848 the *Quarterly Journal of Psychological Medicine and Mental Pathology*, which he conducted until 1865; founded *The Medical Critic* 1861; was chosen vice-president of the Juridical Society and president of the Medical Society of London 1853; was a member of the leading scientific societies. D. at Brighton, Mar. 3, 1874. He was the author of *The Application of the Principles of Phrenology to the Elucidation and Cure of Insanity* (1831); *A Manual of Osteology*; *A Manual of Practical Midwifery*; *Physic and Physicians* (2 vols., 1839); *The Anatomy of Suicide* (1840); *On the Preservation of the Health of the Body and Mind* (1842); *The Plea of Insanity in Criminal Cases* (1843); *Notes on the Lunacy Act* (1845); *On Softening of the Brain, arising from Anxiety and Undue Mental Exercise* (1849); *The Lettsomian Lectures on Insanity* (1854); *On Obscure Diseases of the Brain and Disorders of the Mind* (1860; 4th ed. 1868); *Light, its Influence on Life and Health* (1867). Revised by S. T. Armstrong.

Winslow, Hubbard, D. D.: clergyman and author; b. at Williston, Vt., Oct. 30, 1799; studied at Phillips Academy, Andover, Mass.; graduated with honors at Yale College 1825, and in the Yale theological department 1828; was pastor of the First church at Dover, N. H., 1828–32, and of the Bowdoin Street church, Boston, Mass., 1832–44; was principal of Mt. Vernon (Boston) institute for young ladies 1844–54; took an active part in the discussion of educational questions; was an examiner at Harvard and a trustee of several colleges; visited Europe to inspect educational institutions 1853; edited the *Religious Magazine* and wrote

for numerous periodicals; defended the doctrines of his former instructor, Dr. Nathaniel Taylor, against the attacks of Dr. Bennet Tyler, gaining great repute as a polemical theologian; delivered lectures on scientific, religious, educational, literary, and practical topics, including the duties of citizens; pastor of the First Presbyterian church at Geneva, N. Y., 1857–59, and in charge of the Fiftieth Street Presbyterian church, New York city, 1861–62. D. at Williston, Vt., Aug. 13, 1864. He was the author, among other works, of *The Doctrine of the Trinity* (Boston, 1831); *Controversial Theology* (Boston, 1832); *The Young Man's Aid to Knowledge* (1836); *Appropriate Sphere of Woman* (1837), republished as *Woman as She Should Be* (1838); *Elements of Intellectual Philosophy* (1852); *Elements of Moral Philosophy* (New York, 1856); and *The Hidden Life* (1863).
Revised by S. M. Jackson.

Winslow, Jacques Bénigne: physician; b. at Odense, Denmark, Apr. 2, 1669; was probably a descendant of the English Puritan family of the name at Leyden, Holland; studied medicine at Paris, where he settled; became in 1743 Professor of Anatomy and Physiology at the Jardin du Roi; made important discoveries in anatomy, of which a memorial remains in the name "foramen of Winslow" borne by an opening in the gastro-splenic omentum. He was the author of *Exposition anatomique de la Structure du Corps humain* (Paris, 1732), which was translated into English, German, Italian, and Latin. D. in Paris, Apr. 3, 1760.
Revised by S. T. Armstrong.

Winslow, John: military officer; b. at Marshfield, Mass., May 27, 1702; grandson of Gov. Josiah Winslow; was a captain in the unfortunate British expedition against Cuba 1740; was prominent in the Kennebec and Acadian expeditions, being the principal actor in the expulsion of the Acadians from their homes in 1755; commander at Fort William Henry 1756; took part as major-general in the expedition against Canada 1758–59; became judge of common pleas for Plymouth County 1762; was the founder of the town of Winslow in the district of Maine 1766, and was a member of the Massachusetts Legislature and of the provincial council during the Stamp Act difficulties. D. at Hingham, Mass., Apr. 17, 1774. Most of his family were loyalists, and settled in Nova Scotia during the Revolution.

Winslow, John Ancrum: naval officer; b. at Wilmington, N. C., Nov. 19, 1811. He entered the U. S. navy as a midshipman in 1827; was promoted lieutenant in 1839; served with distinction in the Mexican war; and was promoted commander in 1855 and captain in 1862. In 1863–64 he was given command of the steamer Kearsarge, and assigned to the special duty of pursuing the Confederate privateer Alabama. In June, 1864, he found the Alabama off Cherbourg, France, and blockaded her in that harbor. On the 19th, after notifying Capt. Winslow that he would fight, Capt. Semmes steamed the Alabama out of the harbor, and when 7 miles from shore Capt. Winslow headed the Kearsarge toward the privateer. The latter discharged the first shot, but after an engagement of an hour and a half she sank. Some of her officers were picked up by the English yacht Deerhound, at Winslow's request, which then steamed away to England with them. Capt. Winslow received the thanks of Congress, and was promoted commodore for his victory. In 1866–67 he commanded the Gulf squadron; in 1870–72 was commander-in-chief of the Pacific squadron; and Mar. 2, 1870, was promoted rear-admiral. D. in Boston, Mass., Sept. 29, 1873.

Winslow, Josiah: governor of Plymouth Colony; son of Gov. Edward Winslow; b. at Marshfield, Mass., in 1629; commanded the Marshfield military company 1652; became major and commander-in-chief of the colonial forces 1658; was chosen deputy 1657, and one of the commissioners of the united colonies 1658, to which post he was annually reelected until 1670; served several years as assistant governor, and was governor from 1673 until his death, including the trying period of King Philip's war, when he was both *ex officio* and by virtue of his military rank the general-in-chief of all the forces of the united colonies. D. at Marshfield, Dec. 18, 1680. He was the first native-born governor in New England.

Winslow, Miron, D. D., LL. D.: missionary; brother of Drs. Gordon and Hubbard Winslow; b. at Williston, Vt., Dec. 11, 1789; graduated as valedictorian at Middlebury College 1815, and at Andover Theological Seminary 1818; married 1819 Miss Harriet Wadsworth Lathrop (d. 1833); sailed for Ceylon as a missionary of the A. B. C. F. M. June, 1819; arrived at Jaffna Feb., 1820; labored there and at Oodooville seventeen years; founded the Madras mission 1836; was president of the native college established at that city in 1840; translated the Bible into Tamil (finished about 1835); published educational and religious books in that language; supervised the mission press; wrote largely for the *Missionary Herald* and other European and American periodicals; prepared a *Memoir of Mrs. Harriet Winslow* (New York, 1835), which was widely read for many years, republished in England, and translated into French and Turkish; and devoted three or four hours daily for nearly thirty years to the preparation of his great work, *A Comprehensive Tamil and English Dictionary of High and Low Tamil* (Madras, 1862), partly based upon MS. materials left by the Rev. Joseph Knight—a work of a highly original character, containing over 67,000 Tamil words. D. at the Cape of Good Hope when on a voyage to America, Oct. 22, 1864.
Revised by S. M. Jackson.

Winslow, William Copley, Ph. D., Sc. D., L. H. D., D. D., D. C. L., LL. D.: archæologist and journalist; son of Hubbard Winslow; b. in Boston, Mass., Jan. 13, 1840; received his early education at the Boston Latin School; graduated at Hamilton College 1862, and the General Theological Seminary in New York city 1865, after which he spent a winter in Italy, devoting much of his time to archæological researches in Rome. He assisted in founding the *University Quarterly* 1861; edited the *Hamiltonian* 1862; was assistant editor of the New York *World* 1862–63, and edited the *Christian Times* 1863–65. He officiated temporarily at the Wainwright Memorial church in New York city, and was rector of St. George's church, Lee, Mass., 1867–70, spending his summers in exploring the Adirondacks. He was chaplain of St. Luke's Home, Boston, Mass., for four years, and had temporary charge of churches in Boston, Taunton, and Weymouth. He was for many years executive secretary of the Free Church Association in the Episcopal Church. He devoted his energies chiefly, however, to the promotion of Egyptian exploration, and was for many years vice-president, secretary, and treasurer of the Egypt Exploration Fund for the U. S. He is an honorary fellow of the Royal Archæological Society of Great Britain and the British Archæological Association, and honorary member of many other learned societies, including over twenty State historical societies. He was instrumental in securing many monumental remains from Egypt for the Boston Museum of Fine Arts. Dr. Winslow is a prolific writer and lecturer on archæological subjects and on colonial history. Among his principal works are *Israel in Egypt* (1883); *The Store City of Pithom* (1885); *A Greek City in Egypt* (1887); *The Egyptian Collection in Boston* (1890); and *The Pilgrim Fathers in Holland* (1891).

Winsor, Justin, LL. D.: historian and librarian; b. at Boston, Mass., Jan. 2, 1831; educated at Cambridge, Paris, and Heidelberg; contributed to the *Christian Examiner*, the *Knickerbocker Magazine*, and other periodicals; superintendent of the Boston Public Library 1868–77; librarian of Harvard University since 1877. Among his more important works are *Bibliography of Original Quartos and Folios of Shakespeare* (1875); *Reader's Handbook of the American Revolution* (1880); *Memorial History of Boston* (editor, 4 vols., Boston, 1880–82); *Narrative and Critical History of America* (editor, 8 vols., 1884–89); *Christopher Columbus* (1891); *From Cartier to Frontenac* (1894); *The Mississippi Basin*; *The Struggle in America between England and France 1697–1763* (New York, 1895). D. in Cambridge, Mass., Oct. 22, 1897.
C. H. T.

Winsted: borough; Winchester town, Litchfield co., Conn.; on Mad river, and the Naugatuck Division of the N. Y., N. H. and Hart., and the Phil., Read. and New Eng. railways; 26 miles N. W. of Hartford, 62 miles N. of Bridgeport (for location, see map of Connecticut, ref. 7–F). It contains the villages of Winsted and West Winsted, about a mile apart and connected by one continuous main street about 3 miles in length, following as it does the winding course of Mad river (a branch of the Farmington), which furnishes excellent water-power for manufacturing. The business portion is mainly along the river-bank. Near the western limit of the borough is Long Lake, a natural body of water artificially strengthened, 150 feet above Main Street; area about 400 acres. Superior water-power is furnished by it. The two villages are supplied with water in pipes from Crystal Lake (area about 100 acres), 150 feet

higher up. Winsted is principally engaged in the manufacture of clocks, scythes, book leather, pocket and table cutlery, edge tools, knit goods, undertakers' supplies, pins, wagon-springs, carriage-bolts, and sewing silk. The borough has 2 national banks with combined capital of $280,000, 2 savings-banks with aggregate deposits of over $2,250,000, the Beardsley Public Library (founded in 1874), and 2 daily and 2 weekly newspapers, a convent, and an opera-house. It is one of the shire towns of the county, and has a well-appointed court-house. Pop. (1880) 4,195; (1890) 4,846; (1900) 6,804. EDITOR OF "EVENING CITIZEN."

Winston: city; capital of Forsyth co., N. C.; on the Nor. and West. and the Southern railways; 120 miles W. by N. of Raleigh (for location, see map of North Carolina, ref. 2–F). It adjoins the city of SALEM (*q. v.*), and as the interests of the two cities are nearly identical they are commonly spoken of as one place, by the name of Winston-Salem. Winston has several tobacco warehouses and factories, cotton-mills, iron and wood works, carriage and wagon factories, 3 national banks (combined capital, $450,000), a State bank (capital, $200,000), and a daily and 3 weekly papers. Pop. (1880) 2,854; (1890) 8,018; (1900) 10,008.

Winston, JOHN ANTHONY: Governor of Alabama; b. in Madison co., Ala., Sept. 4, 1812; educated at Lagrange College, Alabama, and at the University of Nashville; settled in 1834 in Sumter County, where he established a large cotton plantation; was a member of the Assembly 1839–40, and again 1842, and of the Senate 1843–52, being president of the latter body 1845–48; engaged in mercantile business at Mobile 1844; was an influential member of the Baltimore convention of 1848, where he was the acknowledged leader of the Alabama Democracy; was the first native-born Governor of Alabama (1853–56); gained the name of the "veto governor" on account of his numerous vetoes of legislative bills; was delegate to the Charleston convention of 1860, and was on the Douglas electoral ticket; went as a commissioner to Louisiana in 1861; raised the Eighth Alabama Infantry for the Confederate service; commanded it at Yorktown and on the Peninsula, but was soon forced to retire through infirm health; was chosen to the State constitutional convention 1865, and elected U. S. Senator in 1866, but was not admitted to a seat. D. at Mobile, Dec. 21, 1871.

Winter [O. Eng. *winter*: O. H. Germ. *wintar* (> Germ. *winter*): Icel. *vetr*: Goth. *wintrus*; perhaps akin to O. Ir. *find*, white, the winter being named from the color of the snow]: astronomically, that season of the year which begins with the shortest day, Dec. 21, and ends with the vernal equinox, Mar. 21. In ordinary speech, however, winter comprises the three coldest months, namely, December, January, and February in the U. S., and November, December, and January in Great Britain. In the southern hemisphere the winter months are June, July, and August, and in the tropical zone the rainy season corresponds to the winter.

Winter, Sir JAMES SPEARMAN: See the Appendix.

Winter, JOHN STRANGE: See STANNARD, HENRIETTA ELIZA VAUGHAN.

Winter, WILLIAM: journalist and dramatic critic; b. at Gloucester, Mass., July 15, 1836; was educated in Boston; graduated at the Harvard Law School and admitted to the bar; published a volume of poems, *The Convent and other Poems*, at Boston in 1854, and another, entitled *The Queen's Domain*, in 1858; went to New York in 1859, and was employed as book reviewer on the *Saturday Press* for a year; wrote for *Vanity Fair* irregularly for a long time; was dramatic critic for the New York *Albion* from 1861 to 1866, and also assistant editor and literary critic; for five years was managing editor and literary and dramatic critic of the New York *Weekly Review*; in 1865 became dramatic critic of the New York *Tribune*; published a third volume of poems, *My Witness* (1871); *Life of Edwin Booth* (1872); *Thistle-down*, verse (1878); *The Trip to England* (1879); *Poems*, complete edition (1881); *The Jeffersons* (1881); *English Rambles* (Boston, 1883); *Life of Henry Irving* (1885); *Shakspere's England* (Edinburgh, 1886); *Stage Life of Mary Anderson* (1886); *The Wanderers* (1888). Revised by H. A. BEERS.

Winterberry: any one of several American shrubs, forming a sub-genus of the *Ilex* or holly; more particularly the black alder (*Ilex verticillata*), which ranges from 5 to 12 feet in height, grows on the edges of swamps, bears clusters of small white flowers, and in November and December an abundance of brilliant crimson berries, sometimes employed in domestic medicine as a bitter tonic.

Wintergreen: one of the many popular names (checkerberry, boxberry, partridge-berry, mountain tea, etc.) for *Gaultheria procumbens*, an evergreen undershrub of the heath family found everywhere in the damp places of the woods of the northern temperate zone, more especially under the shade of evergreens in the forests of Canada and the northern part of the U. S. The stem is from 5 to 6 inches high, with a few leaves, and small flowers appearing in May and June in the axils of the leaves. The berries, which are red, ripen in autumn and remain the winter over. They form a large part of the food of the partridge. Both berries and leaves have the aromatic flavor of sweet birch. See GAULTHERIA. Revised by CHARLES E. BESSEY.

Wintergreen, Oil of, or **Oil of Gaulthe'ria**: an aromatic liquid contained in the leaves of *Gaultheria procumbens*, also in *Betula lenta* (sweet birch), and probably in the roots of *Polygala paucifolia*, *Spiræa ulmaria*, *Spiræa lobata*, and *Gaultheria hispidula*. It is colorless when freshly prepared, but gradually acquires a yellowish or reddish hue; possesses a peculiar sweetish taste and a characteristic and very agreeable odor; has a greater density than any other of the essential oils (1·173), and boils at 412° F. Wintergreen oil contains about 90 per cent. of methyl salicylate (gaultheric acid, $C_8H_8O_3$), and 10 per cent. of a terpene termed *gaultherilene*, isomeric with oil of turpentine. (See TURPENTINE.) The former compound, which is an isomer of anisic acid, is obtained in the distillation of the oil by allowing the boiling-point to rise to 432° F., and then collecting the portion that distills over; it can also be prepared artificially by distilling a mixture of 2 parts of crystallized salicylic acid, 2 parts of wood-spirit, and 1 part of sulphuric acid (sp. gr. 1·66), or by treating wood-spirit with salicylic chlorohydrate. Methyl salicylate has a sp. gr. of 1·18, boils at 431° F., and possesses the taste and odor of the oil from which it is prepared. It is slightly soluble in water, dissolves readily in alcohol and in ether, and unites with bases, forming crystalline salts. Its aqueous solution is colored violet upon addition of a ferric salt. The purity of wintergreen oil can be ascertained by means of this reaction, as well as by its very high specific gravity. It is often employed to disguise the taste of disagreeable medicines, and largely in confectionery. Revised by IRA REMSEN.

Winterhalter, *vin'ter-haăl-ter*, FRANZ XAVER: portrait and genre painter; b. at Menzenschwand, in the Black Forest, Germany, Apr. 20, 1805. He studied at the Munich Academy and afterward in Rome; received medals at the Paris Salon of 1836 and 1837, and at the Paris Exposition of 1855; officer of the Legion of Honor 1857; order of the Red Eagle 1861; commander in the order of Francis Joseph, and received many other decorations. He settled in Paris in 1834, and was the most fashionable portrait-painter of his time, painting portraits of women especially, and receiving commissions from the royal families of France, Great Britain, Belgium, Prussia, Austria, and other countries. D. in Frankfort-on-the-Main, July 8, 1873. Some of his works are in the museum at Versailles. WILLIAM A. COFFIN.

Winterport: town (formerly part of Frankfort; incorporated in 1860); Waldo co., Me.; on the Penobscot river; 13 miles S. of Bangor, 20 miles N. by E. of Belfast (for location, see map of Maine, ref. 8–E). It contains the villages of Winterport, North Winterport, West Winterport, White's Corner, and Ellingwood's Corner, and has 4 churches, public library, semi-monthly newspaper, and manufactories of clothing, lumber, and grist mills. There is a daily line of steamers to Boston, and a ferry connects with the Maine Central Railroad. Pop. (1880) 2,260; (1890) 1,926; (1900) 1,623. EDITOR OF "ADVERTISER."

Winterset: city (platted in 1849, incorporated in 1857); capital of Madison co., Ia.; on the Chi., Rock Id. and Pac. Railway; 42 miles S. W. of Des Moines (for location, see map of Iowa, ref. 6–F). It is in an agricultural and stone-quarrying region, and has 9 churches, 2 large public-school buildings, 2 national banks with combined capital of $100,000, a State bank with capital of $5,330, a private bank, a public library (founded in 1891), and a monthly and 4 weekly periodicals. The city is a trading-point for a large agricultural area. Pop. (1880) 2,583; (1890) 2,281; (1900) 3,039. EDITOR OF "MADISONIAN."

Winther, *vin'ter*, RASMUS VILLADS CHRISTIAN FERDINAND: poet; b. in Fensmark, Zealand, Denmark, July 29, 1796. In 1815 he entered the University of Copenhagen, where his poetical talent soon won recognition from his fel-

low students, and his first collection of poems (1828) immediately brought him national popularity. Among his numerous publications may be mentioned *Nogle Digte* (Some Poems, 1835); *Sang og Sagn* (Song and Legend, 1841); *Lyriske Digte* (Lyrical Poems, 1849); *Nye Digte* (New Poems, 1850). In 1856 he published his masterpiece, *Hjortens Flugt* (The Flight of the Hart), a romantic lyric, dealing with the Danish Middle Ages. Though not the greatest Danish poet, he has given the truest and fullest interpretation of certain elements of the Danish national character. Unlike Oehlenschläger, he never merges into the Scandinavian. D. in Paris, Dec. 30, 1876. Complete *Works* (11 vols., 1860–72). D. K. Dodge.

Winthrop: town; Kennebec co., Me.; on the Maine Cent. Railroad; 10 miles W. of Augusta, 19 miles N. E. of Lewiston (for location, see map of Maine, ref. 9–C). It has six churches, public high school, a national bank with capital of $50,000, a weekly newspaper, a sweet-corn cannery, oil-cloth and blanket factories, and agricultural-implement works; and has become a popular summer resort. Pop. (1880) 2,146; (1890) 2,111; (1900) 2,088. Editor of "Budget."

Winthrop: town (incorporated in 1852); Suffolk co., Mass.; on the Boston, Revere Beach and Lynn Railroad; 3 miles S. E. of Chelsea, 5 miles N. E. of Boston (for location, see map of Massachusetts, ref. 2–I). It has a high school, 15 district schools, public library, 4 churches, 1 all-year and 9 summer hotels, and a weekly newspaper; is a popular beach resort; and is principally engaged in the manufacture of calfskins. In 1894 it had an assessed valuation of $4,573,560. Pop. (1880) 1,043; (1890) 2,726; (1900) 6,058.

Winthrop, Fitz-John: Governor of Connecticut; eldest son of Gov. John Winthrop of Connecticut; b. at Ipswich, Mass., Mar. 14, 1638; resided in childhood at New London, Conn.; was educated in England; held a commission under the Protector Richard Cromwell 1658; returned to Connecticut in 1663; was elected to the Assembly 1671; served as major in King Philip's war; was one of the council of Gov. Andros 1686; became a magistrate in Connecticut 1689; was major-general of the expedition against Quebec 1690; was a highly efficient agent of Connecticut in London 1693–98, and Governor of Connecticut from 1698 until his death, at Boston, Nov. 27, 1707.

Winthrop, James, LL. D.: jurist and author; son of Prof. John Winthrop, physicist; b. at Cambridge, Mass., in 1752; graduated at Harvard 1769; was librarian there 1772–87; participated in the battle of Bunker's Hill, where he was wounded, 1775; was for some years chief justice of the Massachusetts court of common pleas and register of probate. He was the author of *An Attempt to Translate the Prophetic Part of the Apocalypse of St. John into Familiar Language* (Boston, 1794); *A Systematic Arrangement of several Scriptural Prophecies relating to Antichrist* (1795); and *An Attempt to Arrange, in the Order of Time, Scripture Prophecies yet to be Fulfilled* (Cambridge, 1803). He contributed scientific papers to the *Memoirs* of the American Academy. D. at Cambridge, Sept. 26, 1821. He bequeathed his valuable library to Allegheny College, Meadville, Pa. Revised by S. M. Jackson.

Winthrop, John: colonial Governor of Massachusetts; b. near Groton, Suffolk, England, Jan. 22, 1588; studied at Trinity College, Cambridge, 1602–05; is said to have been appointed a justice of the peace at the age of eighteen years. He acquired such influence among the Puritans of the eastern counties and the capitalists of the "Company of the Massachusetts Bay in New England" that he was chosen governor of that body Oct. 30, 1629; was the leader of the great emigration of the following year, when, having sold his Suffolk estates, he sailed in the Arbella at the head of a small fleet bearing some 900 colonists; wrote on board the Arbella his treatise *A Modell of Christian Charity*; landed at Salem June 22, 1630. Endicott had been appointed by the Massachusetts Bay Company to govern the colony in subordination to the governor and company in London, but a change of great historical importance was now made, The entire government was transferred to America, and Winthrop was appointed Governor. He was annually re-elected Governor until 1634, and by his defeat in the ensuing election escaped the chief responsibility for the proceedings against Roger Williams, in which he nevertheless shared as an assistant. He was again defeated at the election of 1636 by the young Sir Henry Vane, then recently arrived, who was put forward as the champion of the Antinomian party directed by Wheelwright and Mrs. Hutchinson; but Winthrop defeated Vane in the next election (1637) and held the office till 1640. As a leading opponent of the Antinomians he took an active part in the banishment of Mrs. Hutchinson and her followers, and in the controversy with Vane, which terminated only with the latter's withdrawal to England. He was again Governor 1642–44, deputy Governor 1644–45, and Governor from 1646 until his death, at Boston, Mar. 26, 1649. He left an interesting and valuable body of correspondence, given in his *Life and Letters* (2 vols., 1864–67) by his descendant, Robert C. Winthrop, and a copious *Journal*, which was edited, from the original MSS., with notes, by James Savage, under the title *The History of New England from 1630 to 1649* (2 vols., Boston, 1825–26; 2d ed. 1853). Many of the *Winthrop Papers* were printed in the *Collections* of the Massachusetts Historical Society (3d series, vols. ix. and x.). The facts concerning his ancestry and early life may be found in William H. Whitmore's *Notes on the Winthrop Family and its English Connections* (Albany, 1864). Revised by F. M. Colby.

Winthrop, John, F. R. S.: Governor of Connecticut; son of John Winthrop, Governor of Massachusetts; b. at Groton, Suffolk, England, Feb. 12, 1606; graduated at Trinity College, Dublin, 1625; studied law at the Inner Temple, London; obtained a commission in the army; participated in the expedition for the relief of the Huguenot garrison at La Rochelle, France, 1627; visited Turkey as an *attaché* of the British embassy 1628; removed to Massachusetts 1631; was chosen a magistrate 1633, and settled at Ipswich, Mar., 1633; went to England the same year; obtained a commission under the grant to Robert Rich, Earl of Warwick, by virtue of which he founded a settlement at Saybrook, at the mouth of Connecticut river, Nov., 1635; built a fort there and acted as governor; removed his family from Boston to Pequot Harbor 1645, and founded New London; was chosen a magistrate of Connecticut 1651, after the union of Saybrook to that colony; was chosen Governor of Connecticut 1657, and annually re-elected through life; went to England 1661; obtained from Charles II. a charter uniting Connecticut and New Haven in one colony, under himself as Governor; was an early member of the Royal Society (founded 1662), and a contributor to its *Transactions*, being well versed in chemistry and physics; represented Connecticut in the congress of the united colonies at Boston 1676, and died there Apr. 5, 1676.

Winthrop, John, LL. D., F. R. S.: physicist; a great-grandson of Gov. John Winthrop; b. in Boston, Dec. 19, 1714; graduated at Harvard 1732; was Hollis Professor of Mathematics and Natural Philosophy in that institution from 1738 until his death; was a profound mathematician and well versed in scholastic discussions; made accurate observations of the transit of Mercury 1740, and that of Venus Jan. 6, 1761, making for the purpose on the latter occasion a voyage to St. John's, Newfoundland; was several years judge of probate for Middlesex County; declined the presidency of Harvard 1769, and again 1774; was a member of the executive council 1773–74, and a firm advocate of political liberty. He was the author of *A Lecture on Earthquakes* (1755); *Two Lectures on Comets* (1759); *Relation of a Voyage from Boston to Newfoundland for the Observation of the Transit of Venus* (1761); *Two Lectures on the Parallax and Distance of the Sun, as deducible from the Transit of Venus* (1769); *Cogitata de Cometis* (1766), communicated by Dr. Franklin to the Royal Society; and other publications. D. at Cambridge, May 3, 1779.

Winthrop, Robert Charles, LL. D.: orator; son of Thomas Lindall Winthrop; b. in Boston, Mass., May 12, 1809; a descendant of Gov. John Winthrop; graduated at Harvard 1828; studied law with Daniel Webster 1828–31; was a Whig member of the Massachusetts Legislature 1836–40, and Speaker of the House 1838–40; a member of Congress 1841–42 and 1843–50; was Speaker of the Thirtieth Congress 1847–49, distinguishing himself through a critical period by his tact as a presiding officer no less than by his graceful eloquence on the floor and his skill in debate. He was U. S. Senator, by executive appointment, to fill the unexpired term of Daniel Webster 1850–51; received a large plurality of popular votes for Governor of Massachusetts 1851, but was defeated in the Legislature; delivered at Boston Nov. 23, 1853, an oration on *Archimedes and Franklin*, which led to the erection of the statue of Franklin in that city; was the orator on the occasion of the inauguration of that monument in 1856, as he had been

at the inauguration of the Boston Public Library 1855, as president of the city library commissioners. He was the efficient president of the Massachusetts Historical Society from 1855 until his resignation in 1885, being also the senior member of that body; and, possessing an ample estate, devoted his leisure to the cause of historical literature, taking little part in political questions after 1854. D. in Boston, Nov. 16, 1894. His speeches in Congress appeared in a volume of *Addresses and Speeches on Various Occasions* (1853), and a second volume, published in 1867, contained, among other notable orations, his eulogies upon William H. Prescott, Josiah Quincy, and Edward Everett. Two other volumes followed, containing his addresses to the close of 1886. He contributed to the *North American Review* and other periodicals, wrote the article on *Washington* for Wilson's *Presidents of the United States, 1789–94*, and is author of a *Memoir of Hon. Nathan Appleton, LL. D.* (1861); of the *Life and Letters of John Winthrop, etc.* (2 vols., Boston, 1864–67); of a volume entitled *Washington, Bowdoin, and Franklin, with a few Brief Pieces on Kindred Topics* (1876); and *Reminiscences of Foreign Travel, a Fragment of Autobiography, Privately Printed* (Boston, 1894). After his death a volume was issued entitled *Tributes to the Memory of Robert C. Winthrop by the Massachusetts Historical Society*. A painting of him in the Capitol at Washington, presented by citizens of Massachusetts, commemorates his speakership and his Yorktown oration, while another portrait in the hall of the Massachusetts Historical Society is a proper reminder of his services to New England history.

Revised by James Grant Wilson.

Winthrop, Theodore: soldier and author; b. at New Haven, Conn., Sept. 22, 1828; graduated with honors at Yale College 1848; traveled in Europe 1849–51 as tutor to a son of William H. Aspinwall; resided two years at Panama in the employ of the Pacific Mail Steamship Company; accompanied Lieut. Strain's expedition in 1853, and made other explorations of South and Central America; studied law at St. Louis, Mo.; was admitted to the New York bar 1855; joined the famous Seventh Regiment of New York on its entering the national service Apr., 1861; was commissioned major in the New York volunteers; became a member of the staff of Gen. B. F. Butler as his military secretary, and was killed at the head of an assaulting column in the earliest formal engagement of the war, at Big Bethel, Va., June 10, 1861. In the *Atlantic Monthly* from June to September of that year were published several spirited sketches of early war-scenes which attracted great attention, and he left ready for the press the materials of five volumes of novels and essays, several editions of which were immediately sold. They were *Cecil Dreeme* (Boston, 1861; 17th ed. 1864); *John Brent* (1862; 14th ed. 1864); *Edwin Brothertoft* (1862); *The Canoe and the Saddle* (1862); and *Life in the Open Air and other Papers* (1863), with a portrait. See *Life and Poems of Theodore Winthrop*, by his sister (New York, 1884). Revised by H. A. Beers.

Winyaw Bay: a body of water in Georgetown co., S. C. It receives the waters of Waccamaw, Pedee, and Black rivers, and is perhaps more properly called the estuary formed by the confluence of those three rivers. It is 14 miles long and 2 miles in average breadth. Large vessels ascend to Georgetown. The main entrance to the bay, called Georgetown entrance, has a brick lighthouse on the north side, lat. 33° 13′ 21″ N., lon. 79° 6′ 44″ W., called Georgetown Light.

Wire and Wire-drawing [*wire* is O. Eng. *wīr*: O. H. Germ. *wiara*, fine-drawn gold, gold ornament: Icel. *vīrr*, wire]: The manufacture of wire depends upon the ductility of metals—that is to say, upon their property of being drawn out into attenuated form. This property is quite different from a capacity for working under the hammer—copper, which is third among the metals in the order of its malleability, being sixth in ductility. Gold, however, stands first in both properties, and silver stands second in both. Apparently these were the first metals from which wire was made. The first wire was fabricated by beating the metal into thin sheets, then cutting these into narrow strips or slivers, which were afterward rounded by hammering or filing. Such wire was woven into fabrics with an admixture of textile material—literally, the cloth of gold. The date when silver was first made into wire is uncertain, the earliest that can be fixed being the time of the later Byzantine emperors. The period when the shears, the hammer, and the file gave way to the draw-plate with graduated holes or dies is not known. The terms "wire-smiths," applied to those who made wire with the hammer, and "wire-drawers" and "wire-millers," applied to those who made it with the die-plate, are both found in German records in the middle of the fourteenth century; and it was doubtless at this time that the draw-plate, which still remains and probably always will remain, the chief appliance in the manufacture of wire, was first invented or brought into use. As the most important use for wire drawn of the precious metals was for purposes of ornamentation, the discovery that by flattening it a given weight could be wound around three times the length of textile fiber was an important step forward, this being the method in which for many purposes gold and silver is applied in ornamentation for tassels, fringe, etc., to this day. Wire was at first manufactured with the draw-plate entirely by hand, but at an uncertain date, probably before the year 1400, a machine, the inventor of which is unknown, was made to operate by water-power. In this, it is said, a lever moved a pair of pincers that opened as they came in contact with one side of the draw-plate, laid hold of the wire, drew it through the hole or die, and after drawing it a certain distance retraced their path, taking a new hold, and repeating the operation. This mechanism was in use in France for making certain kinds of wire well into the nineteenth century, such wire being known by indentations at intervals of about 2 inches along its length where the gripping pincers had taken hold. Nuremberg, so flourishing during the later portions of the Middle Ages in its arts and its manufactures, seems to have been the center from which the art of manufacturing wire extended over Europe, although it is said to have been carried on with very great success in France and Italy. The prosperity of the manufacture in the German city was due to the system of encouraging manufactures by granting exclusive patents, sometimes given by the emperor, sometimes by the council of the city. One of these patentees, Frederick Hagelsheimer, received in 1592 a patent of fifteen years for the making of fine gold and silver wire. This patent appears to have been more than once confirmed, and in 1622 was transformed into a fief or continual privilege to the heirs male of his family. The flattening of wire appears to have been a most important branch of the manufacture, this being done by passing it between rollers. In England wire was made by hand until after the middle of the sixteenth century, and then the art making use of machinery was introduced by foreigners. See Beckmann's *History of Inventions*.

In modern times what is known as gold wire has an exterior of gold and a core of silver, being made by forming a cylindric ingot of silver and coating the latter with gold. This compound ingot is gradually reduced in size by means of the draw-plate—that is to say, by passing it through a succession of holes or dies in a hardened steel plate—first, through one only slightly smaller than the original diameter of the ingot, then through another still smaller, and so on until the requisite reduced diameter is reached. The finest wire ever made (that substituted for the spider-web lines of telescope micrometers) is made by first covering a platinum wire with solid silver. This compound wire, platinum within and silver without, is then reduced in diameter in the same manner as the gold wire with the silver core just referred to. This compound wire may be thus brought down to a diameter of about $\frac{1}{300}$th part of an inch. Assuming a platinum core to be one-tenth the whole diameter, this core will be attenuated to the $\frac{1}{3000}$th part of an inch. This fine compound wire being then dipped into hot nitric acid, the silver is dissolved and the inner core of platinum remains. Platinum wire was made by this means by the inventor, Wollaston, as fine as the $\frac{1}{18000}$th of an inch in diameter.

Wire for industrial purposes is for the most part made of iron and steel. Brass and copper wire are also largely made, the methods of the manufacture being substantially the same as with iron. In the manufacture of iron wire, rods of the requisite quality of metal have their surfaces cleaned of scale or oxide, and are then passed through the successively diminishing holes of the draw-plate—for example, ten, fifteen, thirty, or more times, according to the degree of attenuation required. The constant compression of the molecules of metal upon each other hardens the wire, so that it has to be repeatedly annealed during the successive drawings. This is performed by placing the wire in kilns, which are first heated to redness and then allowed to cool gradually. Twenty-four hours is the time ordinarily required for annealing the smaller grades of wire. Six or eight different annealings are

necessary; very small wire requires more. A scale is formed upon the wire at each annealing, and this is removed by pickling in some acid, preferably dilute sulphuric acid. Wire is sold in coils, and those of the more rigid and stiffer kinds are straightened for use by being passed alternately back and forth on two rows of alternating pins placed a slight distance apart. The wire is thus made to pass in a zigzag course through the device, which is termed a riddle, and comes out straight. Cast-steel wire is made from steel rods hammered to about one-quarter of an inch square by a tilt-hammer, and afterward made round on the anvil. A spurious gold wire, called "gold wire of Lyons," is manufactured by heating copper to a red heat and exposing it to the fumes of zinc, which converts the external portion of the metal into brass. Brass wire loses its strength when exposed to the fumes of acid, and even by long exposure to a damp atmosphere. Zinc wire is flexible, and at first as strong as copper, but resumes the original crystalline state of the metal when subjected to the action of boiling water. The uses and applications of wire are too many to be noted. One of the most unique is the production of surfaces for printing calico, in which copper wires are imbedded in the block, then filed down to a flat surface, and thus form the slightly raised figures upon which the pattern is printed.

A remarkable extension of the wire manufacture has of late years occurred from the universal introduction of barbed wire for fences. The wire is provided with points, or barbs, more or less radial to its axis, and this material provides much the greater portion of fencing in many parts of the world. Other fencing wires are made devoid of barbs, one of the best being oval in cross-section and wavy longitudinally, the alternating curves being in the plane of the greatest diameter of the wire. In 1856 an English projector claimed to "improve the tone in strings or wire used for musical purposes" by gilding the same, depositing "the gold by chemical means or coating by any process in which such covering can be produced." The English experiments extend back to 1768, when it was proposed to fold silver around a copper wire with borax between, and then draw the compound strip thus formed through a draw-plate to unite the metal. Silver was to be covered with a layer of gold and drawn in a similar way. Drawing zinc wire at a temperature of from 210° to 310° F. was patented in 1805. In 1852 the coating of wire with molten metal by drawing it through a bath thereof was described in a patent which also showed a method of excluding air from the bath. Among U. S. inventions, one for which much was claimed, was a combined telegraph wire, comprising a steel core and copper exterior, which was asserted to possess greater conductivity and strength in proportion to its weight and cost than the wire commonly used for such purposes. One of the most valuable improvements in wire manufacture was that patented in Aug., 1858, by Henry Waterman, which reduced the cost of tempering flat steel crinoline wire from $3 a pound to three cents. Previous to this the tempering of such wire was done by winding it in volute coils kept apart by interlaced iron wires, the coils being heated to the requisite degree in a furnace, and then plunged in a hardening bath. In the improved process the wire was drawn through the fire of a furnace, and guided directly from the fire into the hardening bath. It is remarkable that among the 146,119 patents granted in the U. S. previous to the close of the year 1873 there were but five relating to the manufacture of wire, while since that time the improvements have been numerous and important. In 1890 no less than 116 patents were granted for improvements in wire manufacture and articles made from wire. JAMES A. WHITNEY.

Wire-rope: See ROPES AND ROPE-MAKING.

Wire-worm: a term applied to certain myriapods and the larvæ of various beetles, but properly restricted to the tough, light-brown, cylindrical larvæ of various species of elaters, family *Elateridæ*. These beetles are well known under the popular names of spring-beetles, click-beetles, skip-jacks, snapping-bugs, etc. (See ELATER.) The family comprises a number of genera and many species, which vary much in size, though averaging about one-third of an inch. The prevailing color is brown, but a few are jet black and others speckled with white. The larvæ of many species feed upon the roots of living plants, and these are known by the name of wire-worms. The eggs from which they hatch are generally laid loosely in the ground, and the newly hatched larva is invariably pale. The worms are from one to three (or in cold climates even five) years attaining full growth, according to the species, and undergo a larger number of moults than are necessary to most insects. The head is somewhat flattened, and there are six true legs near it; the body consists of thirteen joints, and the last generally has at its base, beneath, a retractile proleg. When full grown they descend deeper into the earth, and go through their transformations within an oval cavity, most of them issuing as beetles in early summer. Wire-worms are among the greatest insect pests of the farmer, doing more or less damage to all the grasses and cereals, and often eating into and ruining potatoes, onions, turnips, and injuring various other root-crops and bulbous flowers. Wire-worms are always abundant in meadows, and crops grown on pasture or meadow land recently broken suffer most from them. In the U. S. the crops most affected are wheat and Indian corn. The remedies proposed and adopted to counteract their injuries are innumerable. As wire-worms can not subsist on the soil, as does the earth-worm, and as they mostly require about three years to come to full growth, one of the most effectual ways to prevent their injuries is to fallow the land for one year, but in order to be effectual the fallow must be thorough and the ground plowed often enough in summer to keep down the weeds. In a small plot of ground they may be trapped by strewing on the surface sliced potatoes, turnips, lettuce, or other succulent vegetables. Being unusually fond of these, the worms eat into them, and while doing so may be collected and destroyed. Fall plowing, by which the worms are exposed to their natural enemies, especially birds, at a time when most insect-life is sluggish, and submersion, where feasible, are two of the most practicable ways of destroying them on a large scale. Corn soaked over night in copperas-water before planting is generally left untouched by them. As the worms have a great partiality for rape-cake, this, mixed with Paris green and spread in lumps over a field from which domestic animals can be excluded, is probably the best of all the remedies, and it acts at the same time as a manure. Revised by J. S. KINGSLEY.

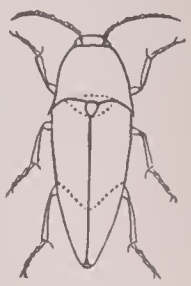


FIG. 1. Click-beetle.

FIG. 2.—Wire-worm.

Wirt, WILLIAM, LL. D.: lawyer and author; b. at Bladensburg, Md., Nov. 8, 1772; was left an orphan at the age of eight years, and brought up by an uncle; was educated at the grammar school of Rev. James Hunt, of Montgomery County; was afterward tutor nearly two years in the family of Benjamin Edwards, of Maryland, father of Gov. Ninian Edwards, of Illinois; studied law; began practice in Culpeper and Albemarle cos., Va., 1792; married and settled at Pen Park, near Charlottesville, Va., 1795; removed after his wife's death to Richmond 1799; served three years as clerk to the house of delegates; became chancellor of the eastern district of Virginia, and married a second time 1802; settled as a lawyer at Norfolk 1803, and published in the *Virginia Argus* his celebrated *Letters of a British Spy*, which passed through twelve editions; wrote for the *Richmond Enquirer* a series of essays entitled *The Rainbow* 1804; returned to Richmond 1806; was an assistant in the prosecution of Aaron Burr 1807; sat in the house of delegates 1807–08; wrote the collection of essays entitled *The Old Bachelor*, which originally appeared in the *Enquirer* in 1812; was appointed U. S. attorney for the district of Virginia 1816; was Attorney-General of the U. S. for three full terms during the administrations of Monroe and John Quincy Adams 1817–29; delivered at Washington a discourse commemorative of the death of Adams and Jefferson Oct. 19, 1826; settled at Baltimore 1830; and was the anti-Masonic candidate for the presidency of the U. S. 1832, and received for that office the electoral vote of Vermont. D. at Washington, D. C., Feb. 18, 1834. His chief work was *Sketches of the Life and Character of Patrick Henry* (Philadelphia, 1817; 15th ed. Hartford, 1852). His *Life* was written by John P. Kennedy (2 vols., 1849).

Wisbech, wiz'bēēch: town of Cambridgeshire, England; in the Isle of Ely, on the Nene; 40 miles N. of Cambridge (see map of England, ref. 9–K. It is well built, and carries on a variety of manufactures and an active general trade. Vessels of nearly 500 tons can ascend from the Wash. Pop. (1891) 9,395.

Wisby, or **Visby**, vis'bü: the only town on the west coast of the Swedish island of Gothland (see map of Norway and Sweden, ref. 12–G.). During the Middle Ages it was an important commercial city. In 1361 the Danish king Waldemar IV. sacked it and destroyed its importance. Only recently it began to recover, and is now a rather thriving commercial place with a population of 7,102 (1891).

Wiscas'set: town (incorporated as Pownalboro in 1760, and under its present name in 1802); capital of Lincoln co., Me.; on the Sheepscot river, and the Maine Cent. Railroad; 20 miles N. of the Atlantic Ocean, 50 miles N. E. of Portland (for location, see map of Maine, ref. 10–D). It is a port of entry and a popular watering-place; has Congregational, Methodist Episcopal, and Protestant Episcopal churches, seven public-school buildings, U. S. Government building, a national bank with capital of $100,000, a savings-bank, and a weekly newspaper; and is principally engaged in commerce, manufacturing, and farming. Pop. (1880) 1,847; (1890) 1,733: (1900) 1,273.

Wiscon'sin: one of the U. S. of North America (North Central group); the seventeenth State admitted to the Union; capital, Madison.

Location and Area.—It is situated between lat. 42° 27′ and 47° N., and lon. 86° 53′ and 92° 53′ W.; is bounded N. by Lake Superior, N. E. by the Upper Peninsula of Michigan, E. by Lake Michigan, S. by Illinois, and W. by Iowa and Minnesota; extreme length from N. to S., 300 miles; extreme breadth, 250 miles; coast-line over 500 miles; area, according to the U. S. census, 56,040 sq. miles (35,865,600 acres), of which 1,590 sq. miles are water surface.

Seal of Wisconsin.

Physical Features.—There are no mountains in Wisconsin; the lowest level is 600 feet above the sea, and the highest 1,800 feet. The greatest swell is the Penokee range of Laurentian or granite hills, running N. E. by S. W., some 30 miles S. of Lake Superior, and forming with its outlying spurs a triple watershed—the northward descent carrying streams flowing into Lake Superior; that sloping to S. E., the feeders of Lake Michigan; and that dipping S. and S. W., the affluents of rivers emptying into the Mississippi. A longitudinal ridge of Niagara limestone follows the shore of Lake Michigan, about 30 miles in the interior, and in the main separates the lake drainage from that of the Mississippi. In the Glacial period Wisconsin, excepting about 10,000 sq. miles in the southwest, was covered by the ice cap, which left about 2,000 minor lakes in the eastern and northern portions, with many picturesque gravel knolls, domes of drift, and morainic peaks and ridges. In the driftless area, deep detritic valleys, erosion cliffs, and castellated outlines are characteristic features. One of the chief characteristics of the State is the diagonal valley occupied by Wisconsin and Fox rivers, and Green Bay. About the center of this valley, at Portage, the Fox and Wisconsin rivers (the one a member of the Great Lakes drainage system, the other flowing into the Mississippi) are separated by a marsh but 1½ miles in width, which is sometimes overflowed in spring. The principal Wisconsin rivers which flow into Lake Superior are the St. Louis, Bois Brulé (a famous trout-fishing stream), Bad, and Montreal; into Green Bay are discharged the Fox, Pensaukee, Oconto, Peshtigo, and Menominee; Lake Michigan receives the Kewaunee, East and West Twin rivers, Manitowoc, Sheboygan, and Milwaukee; and the chief rivers emptying into the Mississippi from Wisconsin are the Wisconsin, Black, Trempealeau, Buffalo, Chippewa, and St. Croix, the latter forming with the interlocking Bois Brulé a famous French fur-trade route. The largest interior lake is WINNEBAGO (*q. v.*).

Soil and Productions.—In the central part of the State are wide areas of comparatively unfertile, sandy soil, derived from the underlying Potsdam sandstone; in the Penokee range are tracts too rocky for successful agriculture; but for the most part the soils are arable, and some of them highly fertile, consisting in the drift area of sandy and clay loams, derived from the heterogeneous mixture of pre-glacial soils and glacial grindings; and in the driftless S. W., of the results of the decomposition of underlying limestone. Before the advent of whites, heavy forests covered much of the State—oaks, maples, ash, poplars, hickories, and the like. Great regions in the north were timbered with pines, hemlocks, and spruce, with which were mingled many deciduous trees. In the south and west the colonists found large prairies surrounded by forests of hard wood, and also much country in which the woods were dotted with small treeless areas. Most of the timber in the south and east has been removed by agricultural settlers, and the northern conifers have suffered much depletion from lumbering operations; but there remains a large belt of "pinery district." The chief agricultural productions are Indian corn, oats, potatoes, barley, root-crops, grass seed, and wheat; in the southern counties of Dane, Rock, and Jefferson tobacco is an important crop; live stock and dairy products are large interests in the south and east, the latter in 1890 amounting to 303,701,134 gal. of milk, 46,295,623 lb. of butter, and 906,266 lb. of cheese; and there are extensive cranberry marshes, with an annual product of 500,000 bush., in the central and northwestern sections. The severe winters are not favorable to the culture of apples, grapes, peaches, and pears, but small fruits and vegetables are grown in large quantities. The capital invested in nurseries is about $500,000.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms	134,322	146,409	9·0
Total acreage of farms	15,353,118	16,787,988	9·3
Total value of farms, including buildings and fences	$357,709,507	$477,524,507	33·5

* Increase.

The following table, compiled from U. S. reports, shows the acreage, yield, and value of the principal crops in the calendar year 1900:

CROPS.	Acreage.	Yield.	Value.
Corn	1,238,681	49,547,240 bush.	$16,350,589
Wheat	849,458	13,166,599 "	8,426,623
Oats	1,936,611	61,971,552 "	14,253,457
Rye	190,534	3,010,437 "	1,475,114
Barley	245,458	6,259,179 "	2,754,039
Buckwheat	27,533	385,462 "	227,423
Potatoes	151,647	15,619,641 "	4,373,499
Tobacco (1896)	3,975	5,088,000 lb.	279,840
Hay	1,059,438	1,218,354 tons	11,757,116
Totals	5,704,335	.....	$59,897,700

On Jan. 1, 1900, the farm animals comprised 418,018 horses, value $25,722,329; 4,611 mules, value $294,128; 1,003,321 milch cows, value $33,711,586; 595,208 oxen and other cattle, value $16,267,023; 744,656 sheep, value $2,716,505; and about 900,000 swine, value $5,000,000—total head, 3,665,814; total value, $83,701,571.

Climate.—The climate is similar to that of other interior States upon the same latitude. The winters are protracted and often severe, the mean winter temperature varying from about 25° in the southern tier of counties to about 15° on the Lake Superior shore; but the atmosphere is dry, and this low temperature does not represent the discomfort it would induce in seaboard States. The summer is brief and warm, the mean temperature varying from about 70° in the extreme south to about 60° in the extreme north; but there are frequent brief rains, and cool southern and eastern winds. The following is a table of means for the entire State for 1893 as computed by the Wisconsin weather service:

MONTHS.	Temperature.	Precipitation.	MONTHS.	Temperature.	Precipitation.
January	5·5° F.	1·48 in.	July	71·1° F.	3·90 in.
February	12·7	1·84	August	66·7	2·03
March	25·8	2·30	September	59·1	2·32
April	40·8	4·45	October	48·5	2·49
May	52·0	2·54	November	31·3	1·33
June	68·6	2·45	December	16·0	2·67

Annual mean temperature, 41·5° F.; annual precipitation, 29·80 in.

WISCONSIN
LAKE SUPERIOR
LAKE MICHIGAN
LAKE WINNEBAGO
MINNESOTA
IOWA
ILLINOIS
MICHIGAN
Scale of Miles
0 10 20 30 40 50 60
County Towns
Longitude West from Greenwich
Duluth
Superior
Ashland
Bayfield
Washburn
Hurley
Bessemer
Ontonagon
Houghton
Eagle River
Marquette
Escanaba
Menominee
Green Bay
Oconto
Marinette
Menasha
Neenah
Appleton
Oshkosh
Fond du Lac
Sheboygan
Manitowoc
Kewaunee
Sturgeon Bay
Milwaukee
Racine
Kenosha
Waukesha
Madison
Janesville
Beloit
Whitewater
Watertown
Beaver Dam
Portage
Baraboo
Wisconsin Dells
Stevens Point
Wausau
Merrill
Rhinelander
Ashland
Superior
Hayward
Spooner
Barron
Menomonie
Eau Claire
Chippewa Falls
Prairie du Chien
La Crosse
Viroqua
Platteville
Dubuque
Galena
Freeport
Rockford
Belvidere
Janesville
Beloit
Monroe
Mt. Carroll
Oregon
Sycamore
Geneva
Wheaton
Chicago
Joliet
Ottawa
Princeton
Rock Island
Clinton
Morrison
Dixon
Waterloo
Independence
Manchester
Anamosa
Maquoketa
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Marion
Waterloo
Cedar Rapids
Dubuque
Davenport
Muscatine
Burlington
Keokuk
Fort Madison
Ottumwa
Oskaloosa
Marshalltown
Iowa City
Cedar Rapids
Waterloo
Fort Dodge
Boone
Ames
Des Moines
Indianola
Winterset
Creston
Corning
Shenandoah
Red Oak
Atlantic
Council Bluffs
Sioux City
Le Mars
Cherokee
Spencer
Storm Lake
Sioux City
Onawa
Denison
Harlan
Atlantic
Carroll
Ida Grove
Sac City
Fort Dodge
Webster City
Iowa Falls
Eldora
Marshalltown
Grinnell
Newton
Oskaloosa
Ottumwa
Centerville
Chariton
Bloomfield
Keokuk
Fort Madison
Burlington
Mt. Pleasant
Fairfield
Ottumwa
Oskaloosa
Pella
Knoxville
Chariton
Bloomfield
Centerville
Corydon
Mt. Ayr
Lamoni
Leon
Chariton
Princeton
Galena
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Belvidere
Woodstock
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Corydon
Mt. Ayr
Lamoni
Leon
Chariton
Princeton
Galena
Freeport
Rockford
Belvidere
Woodstock
Waukegan

As compared with 1891 and 1892, the year was an average of 3° colder; the precipitation was slightly below normal, the average yearly rainfall being 30 inches. The average velocity of wind in 1893 was 8 miles per hour, the highest velocity being 56 miles from the W. on May 11. The total snowfall was 69 inches, a third more than the previous year. The mean barometric pressure was 30 inches, the highest reading being 31·01 (Feb. 3) and the lowest 28·95 (Apr. 20), an extreme range of 2·06 inches, which is above normal. The last severe spring frost was May 8, but there were frosts in northern counties as late as the 28th; killing frosts were reported Aug. 29 and 30, and light frosts at intervals to Sept. 24, when the temperature fell to or below freezing. These were somewhat unusual dates both as to lateness and earliness. During the year there were 124 hailstorms and 67 thunderstorms, the latter most frequent in July.

Divisions.—For administrative purposes the State is divided into seventy counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Adams	6-D	6,889	9,141	Friendship	.....
Ashland	2-C	20,063	20,176	Ashland	13,074
Barron	3-B	15,416	23,677	Barron	1,493
Bayfield	2-C	7,390	14,392	Washburn	6,814
Brown	5-F	39,164	46,359	Green Bay	18,684
Buffalo	5-B	15,997	16,765	Alma	1,201
Burnett	3-A	4,393	7,478	Grantsburg	1,688
Calumet	5-F	16,639	17,078	Chilton	1,460
Chippewa	3-C	25,143	33,037	Chippewa Falls	8,094
Clark	4-C	17,708	25,848	Neillsville	2,104
Columbia	6-D	28,350	31,121	Portage	5,459
Crawford	7-C	15,987	17,286	Prairie du Chien	3,232
Dane	7-D	59,578	69,435	Madison	19,164
Dodge	6-E	44,984	46,631	Juneau	891
Door	4-F	15,682	17,583	Sturgeon Bay	3,372
Douglas	2-B	13,468	36,335	Superior	31,091
Dunn	4-B	22,664	25,043	Menomonee	5,655
Eau Claire	4-C	30,673	31,692	Eau Claire	17,517
Florence	3-E	2,604	3,197	Florence	1,824
Fond du Lac	6-E	44,088	47,589	Fond du Lac	15,110
Forest	3-E	1,012	1,396	Crandon	706
Grant	7-C	36,651	38,881	Lancaster	2,403
Green	7-D	22,732	22,719	Monroe	3,927
Green Lake	6-E	15,163	15,797	Dartford	450
Iowa	7-D	22,117	23,114	Dodgeville	1,865
Iron †	2-D	.....	6,616	Hurley	....
Jackson	5-C	15,797	17,466	Black River Falls	1,938
Jefferson	7-E	33,530	34,789	Jefferson	2,584
Juneau	6-D	17,121	20,629	Mauston	1,718
Kenosha	7-F	15,581	21,707	Kenosha	11,606
Kewaunee	5-F	16,153	17,212	Kewaunee	1,773
La Crosse	6-B	38,801	42,997	La Crosse	28,895
La Fayette	7-C	20,265	20,959	Darlington	1,808
Langlade	4-E	9,465	12,553	Antigo	5,145
Lincoln	3-D	12,008	16,269	Merrill	8,537
Manitowoc	5-F	37,831	42,261	Manitowoc	11,786
Marathon	4-D	30,369	43,256	Wausau	12,354
Marinette	4-F	20,304	30,822	Marinette	16,195
Marquette	6-D	9,676	10,509	Montello	1,325
Milwaukee	7-F	236,101	330,017	Milwaukee	285,315
Monroe	6-C	23,211	28,103	Sparta	3,555
Oconto	4-E	15,009	20,874	Oconto	5,646
Oneida	3-D	5,010	8,875	Rhinelander	4,998
Outagamie	5-E	38,690	46,247	Appleton	15,085
Ozaukee	6-F	14,943	16,363	Port Washington	3,010
Pepin	5-B	6,932	7,905	Durand	267
Pierce	4-A	20,385	23,943	Ellsworth	1,052
Polk	3-A	12,968	17,801	Osceola	466
Portage	5-D	24,798	29,483	Stevens Point	9,524
Price	3-C	5,258	9,106	Phillips	1,820
Racine	7-F	36,268	45,644	Racine	29,102
Richland	6-C	19,121	19,483	Richland Center	2,321
Rock	7-E	43,220	51,203	Janesville	13,185
St. Croix	4-A	23,139	26,830	Hudson	3,259
Sauk	6-D	30,575	33,006	Baraboo	5,751
Sawyer	3-C	1,977	3,593	Hayward	2,720
Shawano	4-E	19,236	27,475	Shawano	1,863
Sheboygan	6-F	42,489	50,345	Sheboygan	22,962
Taylor	4-C	6,731	11,262	Medford	1,758
Trempealeau	5-B	18,920	23,114	Whitehall	600
Vernon	6-C	25,111	28,351	Viroqua	1,950
Vilas †	2-D	.....	4,929	Eagle River	1,356
Walworth	7-E	27,860	29,259	Elkhorn	1,731
Washburn †	3-B	2,926	5,521	Shell Lake	1,823
Washington	6-F	22,751	23,589	West Bend	2,119
Waukesha	7-F	33,270	35,229	Waukesha	7,419
Waupaca	5-E	26,794	31,615	Waupaca	2,912
Waushara	5-E	13,507	15,972	Wautoma	1,060
Winnebago	5-E	50,097	58,225	Oshkosh	28,284
Wood	5-D	18,127	25,865	Grand Rapids	4,493
Totals	.....	1,686,880	2,069,042		

* Reference for location of counties, see map of Wisconsin.
† Not organized in 1890.

Principal Cities and Towns, with Population for 1900.—Milwaukee, 285,315; Superior, 31,091; Racine, 29,102; La Crosse, 28,895; Oshkosh, 28,284; Sheboygan, 22,962; Madison, 19,164; Green Bay, 18,684; Eau Claire, 17,517; Marinette, 16,195; Fond du Lac, 15,110; Appleton, 15,085; Janesville, 13,185; Ashland, 13,074; Wausau, 12,354; Manitowac, 11,786; Kenosha, 11,606; Beloit, 10,436; Stevens Point, 9,524; Merrill, 8,537; Watertown, 8,437; Chippewa Falls, 8,094; Waukesha, 7,419; Neenah, 5,954; Baraboo, 5,751; Menomonee, 5,655; Oconto, 5,646; Menasha, 5,589; Portage, 5,459; Marshfield, 5,240; Antigo, 5,145; Beaver Dam, 5,128; Kankanna, 5,115.

Population and Races.—In 1840, 30,945; 1850, 305,391; 1860, 775,881; 1870, 1,054,670; 1880, 1,315,497; 1890, 1,686,880 (native, 1,167,681; foreign, 519,199; male, 874,951; female, 811,929; white, 1,680,473; colored, 6,407, of whom 2,444 were persons of African descent, and 3,835 were civilized Indians). The aggregate of other Indians was 8,896, of whom 7,915 lived on reservations (Green Bay agency 3,137, and La Pointe agency 4,778) and 981 off. The principal native tribes are Chippewa, Menomonee, and Winnebago; the Stockbridges were removed hither from Massachusetts and the Oneidas from New York.

Industries and Business Interests.—The U. S. census returns of 1890 showed that 10,417 mechanical and manufacturing establishments reported. These had a combined capital of $246,515,404, and employed 132,031 persons, to whom $51,843,708 was paid in wages. The total value of the plants was $125,455,518, of which $43,228,127 was invested in machinery, tools, and implements. During the census year materials costing $145,437,016 were used in the manufactories, whose combined output was valued at $248,546,164. The following table gives details of industries having an output valued at $2,000,000 and upward:

PRODUCTS.	Establishments.	Employees.	Wages paid.	Value of output.
Lumber-mill products from logs or bolts	853	32,755	$10,046,413	$52,115,739
Flour and grist mill products	497	2,300	1,172,505	24,252,297
Malt liquors	107	3,165	1,864,579	14,193,057
Leather	38	2,570	1,371,967	11,161,850
Slaughtering and meat-packing products	28	1,006	501,533	10,657,911
Timber products, not mill manufactures	266	10,123	1,852,757	8,850,705
Foundry and machine-shop products	155	5,304	2,836,433	8,467,290
Butter, cheese, and condensed milk	966	1,817	545,361	6,960,711
Iron and steel	9	1,920	4,613,753	6,501,761
Planing-mill products	88	3,705	1,623,889	6,295,810
Agricultural implements	51	3,031	1,489,673	5,015,512
Paper	19	1,613	695,221	4,216,593
Furniture	130	2,836	1,210,717	3,553,225
Boots and shoes	32	2,155	875,785	2,972,233
Cigars and cigarettes	355	1,967	868,872	2,524,949
Malt	15	378	238,091	2,472,018

The fishing industry is one of much importance. In Lakes Michigan and Superior, according to the census, Wisconsin had capital invested in 1889, $326,744; number of vessels and boats employed, 956; men employed, 1,484; and value of catch, $455,030. The State fish commissioners reported that the catch in 1894 amounted to $869,737, and that the capital invested in the industry was $1,016,278. The value of the fisheries on the inland lakes and rivers probably amounts to a like figure. The fishing interests of the State are controlled by a State commission which conducts large hatcheries at Madison, Bayfield, and Milwaukee for the artificial propagation of fry, with which the Great Lakes and inland waters are annually stocked.

Finances.—The total receipts of the general fund in the biennial period 1893–94 were $3,835,732; total disbursements, $3,693,733; amount of productive school fund on Sept. 30, 1894, $3,418,760; property valuation on which tax was levied in 1894, $600,000,000; amount of State tax, $595,684; total town, city, village, and county taxes, $14,725,939. The bonded debt of the State, created in 1861–65 for war purposes, has all been paid or converted into certificates of indebtedness to the trust funds, except $1,000, which was paid from the general fund Aug. 13, 1888. The total receipts and expenditure of the State are about $5,000,000 annually. The total assessed valuation of taxable property in 1900 was $625,000,000.

Banking.—On Sept. 5, 1900, there were 88 national banks with a combined capital of $10,312,700, surplus and profits of $3,780,255.54, and individual deposits of $62,732,942.28; on July 2, 137 State banks, capital $6,417,725; surplus and profits $2,083,611, and deposits $45,929,285; 127 private banks, capital $1,136,000, surplus $536,712, and deposits

$10,431,449; and 1 mutual savings-bank with surplus of $30,584, and $568,187 in savings-deposits from 2,945 depositors.

Means of Communication.—The railway mileage Dec. 31, 1894, aggregated 6,010·06. The leading companies were Chicago, Milwaukee and St. Paul, 1,644·73 miles; Chicago and Northwestern, 1,579·62; Wisconsin Central, 781·96; Chicago, St. Paul, Minneapolis and Omaha, 620·07; Minneapolis, St. Paul and Sault Ste. Marie, 276·02; Green Bay, Winona and St. Paul, 224·80; and Chicago, Burlington and Northern, 222·56. In 1899 the total mileage was 6,483·80. There are but two canals within the State, both small and owned by the U. S. Government, one, now seldom used, connecting Fox and Wisconsin rivers at Portage; the other, convenient for long-shore traffic, connecting the waters of Green Bay and Lake Michigan, at Sturgeon Bay.

Churches.—The census of 1890 gave the following statistics of the religious bodies having a membership of 1,000 and upward in the State:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic	646	666	249,164	$4,859,950
Lutheran Synodical Conference	388	357	83,942	1,306,303
Methodist Episcopal	706	705	41,360	1,791,900
Lutheran, United Norwegian	187	183	28,717	394,450
Congregational	182	196	15,841	1,089,750
Lutheran, Norwegian Evang	95	94	15,037	200,800
Baptist, Regular, North	192	198	14,152	838,945
Evangelical Association	224	225	12,553	355,100
German Evang. Synod of N. A	63	63	11,410	182,700
Presb. in the U. S. of America	131	141	11,019	877,400
Protestant Episcopal	133	135	10,457	1,035,978
Lutheran, Joint Syn. of Ohio, etc.	25	41	7,356	80,600
Reformed Church in the U. S	55	56	5,966	143,750
Lutheran, General Council	41	41	3,099	52,325
Welsh Calvin, Methodist	41	52	2,641	114,500
Lutheran, Hauge's Synod	28	27	2,165	20,150
Lutheran, Ind. Congregations	13	13	2,114	26,200
Lutheran, Danish Evangelical	16	15	2,076	22,200
Lutheran, Gen. Augsburg Synod	10	10	1,991	20,310
Seventh-day Advent	58	58	1,892	28,850
United Brethren in Christ	47	47	1,687	39,275
Free-will Baptist	48	51	1,683	94,400
Moravian	19	19	1,477	27,900
Unitarian	16	16	1,394	238,500
Reformed Church in America	11	13	1,349	40,100
Disciples of Christ	24	18	1,317	30,300
Jews	8	8	1,231	112,000
Lutheran, Buffalo Synod	7	7	1,158	19,600
Seventh-day Baptist	10	10	1,078	26,475

Schools.—The total receipts for educational purposes, as reported by the U. S. Commissioner of Education, were in 1899 $5,403,431; the expenditure $5,132,063. The total expenditure in 1900, as reported by the State Commissioner, was $6,721,876.08. In 1900 there were 731,063 children of school age, of whom 445,141 were enrolled in the public schools. There were 12,465 teachers in 1899—2,654 men and 9,811 women. The average monthly salaries were in 1900: men, $43.84; women, $31.79. There were 6,940 public-school houses; and 219 high schools; normal schools; State schools for deaf, deaf-mute, blind, indigent, and incorrigible children; and a State university. (See WISCONSIN, UNIVERSITY OF.) The State University has also in charge an admirable and far-reaching system of farmers' institutes, and was a pioneer in the work of university extension, having in both these fields special staffs of lecturers. An important work, in connection with public instruction, is the fostering of town and district libraries, the former maintained through withholding a portion of the school fund income and the latter by local taxation. The Roman Catholic Church, in addition to parochial and charitable schools, maintains several colleges, chiefly Pio Nono at St. Francis, Marquette (Jesuit) at Milwaukee, Sta. Clara at Sinsinawa Mound, Ste. Catherine at Racine, and St. Lawrence at Mt. Calvary. The Lutheran colleges are Concordia at Milwaukee, Northwestern University at Watertown, a theological seminary at Wauwatosa, and a mission-house at Franklin. Other denominational colleges are chiefly Beloit and Ripon (Congregational), Lawrence University (Methodist) at Appleton, Milwaukee—Downer (Congregational) at Milwaukee, Racine (Protestant Episcopal), Milton (Seventh-day Baptist), Carroll (Presbyterian) at Waukesha.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, Wisconsin had 83 libraries, containing 453,534 bound volumes and 133,566 pamphlets. The libraries were classified as follows: General, 28; school, 27; college, 15; law, 1; theological, 4; public institution, 2; Y. M. C. A., 1; scientific, 1; historical, 1; society, 2; and not reported, 1. In 1895 there were about 100 public, college, and subscription libraries, with about 600,000 volumes, and 900 small township libraries, under the supervision of the State superintendent of public instruction. The legislature has provided for a State library commission.

Post-offices and Periodicals.—In Jan., 1901, there were 1,909 post-offices, of which 148 were presidential (5 first-class, 30 second-class, 113 third-class, and 1,761 fourth-class). There were 850 money-order offices and 21 money-order stations. The newspapers and periodicals comprised 64 daily, 12 semi-weekly, 520 weekly, 2 bi-weekly, 2 semi-monthly, 52 monthly, 1 bi-monthly, and 4 quarterly publications; total, 657.

Charitable, Reformatory, and Penal Institutions.—The State board of control, composed of five members appointed by the Governor, has supervision over the Insane Hospitals near Madison and Oshkosh, School for the Deaf at Delavan, School for the Blind at Janesville, Industrial School for Boys at Waukesha, State Prison at Waupun, Home for the Feeble-minded at Chippewa Falls, the State School for Dependent Children at Sparta, and the State Reformatory at Green Bay. The current expenses of the nine institutions for the two years ending Sept. 30, 1900, were $1,272,379.20. Since Oct. 1, 1900, all the expenditures of the State institutions must be audited by the Secretary of State, and all income reported to him. The board also has charge of 23 county chronic-insane asylums, 68 jails, and 51 city and county poor-houses. It officially inspects and reports on all police stations and lock-ups, and all private benevolent institutions; and supervises four semi-State institutions—the Milwaukee Insane Hospital, Milwaukee House of Correction, Wisconsin Industrial School for Girls at Milwaukee, and the Wisconsin Veterans' Home at Waupaca.

Political Organization.—The Legislature is composed of a Senate of 33 members and an Assembly of 100, and members must be voters and residents of their districts. All State, county, and district officers, except school officers, must be voters. The Governor and Lieutenant-Governor must be voters and citizens of the U. S., so also judges, who must be not under twenty-five years of age. Only males, twenty-one years of age, are qualified to vote. If a foreigner, the voter must have resided one year within the State and declared his intention to become a citizen. Indians made citizens by Congress may vote. The classes disqualified are idiots and insane persons; convicts, unless restored to civil rights; U. S. soldiers or marines stationed within the State; those who have a wager pending on the election; and duelists. Members of Congress, U. S. officers, officers of foreign powers, criminals, or defaulters can not be elected to any post of trust, honor, or profit within the State. Sheriffs are ineligible for re-election to succeed themselves. General State elections are held in November, biennially; elections for judges and town and village officers in April. There is a State Supreme Court with five justices, seventeen circuit judges, a probate judge in each county, and in certain cities municipal judges, all elected by popular vote.

History.—Situated at the head both of the Great Lakes and the Mississippi valley, and drained by interlacing rivers which at their sources so closely approach each other that the canoe-voyager can with ease pass from one great water system to the other, the geographical character of Wisconsin became, very early in the history of New France, an important factor in the development of the West. It also was the meeting-point between the Algonkin and Dakotah tribes. In 1634 Champlain, then governor of New France, sent Jean Nicolet, a *coureur des bois* (wood-ranger), to make treaties with the Indians and induce them to trade with the French of Quebec and Montreal. Nicolet landed at the site of Green Bay, ascended the Fox river to about the site of Berlin, and thence went overland to Illinois, returning home, doubtless, by way of the Chicago portage and Lake Michigan. The next recorded visit of whites to Wisconsin was that of the traders Radisson and Groseilliers in 1658–59. They ascended the Fox, and, it is believed, descended the Wisconsin; there is small reason to doubt that they were the first to set eyes on the upper Mississippi. In 1661 they were on Lake Superior, and built a stockade fort on the southwest shore of Chequamegon Bay, near Ashland. It is probable that Father Allouez, the first missionary to Wisconsin, built his mission of La Pointe on the site of this fort. Four years later Allouez established St. Francis Xavier mission at the rapids near the mouth of the Fox, the site of the

present Depere. In 1673 Louis Jolict and Father Marquette tarried at the mission while on their celebrated tour by way of the Fox and Wisconsin rivers to explore the Mississippi river; and after their return Marquette stayed there through the winter and wrote his journal of the trip. In 1674 Marquette made a canoe trip along the Lake Michigan shore of Wisconsin from Green Bay to Chicago, as did also La Salle five years later. It was among the islands of Green Bay that La Salle's Griffon, the first sailing vessel on the upper lakes, was lost in a storm. Another notable traveler in Wisconsin was Du l'Hut (Du Luth), who in 1680 made a fur-trading trip up the Bois Brulé river and down the St. Croix. Five years later Nicholas Perrot, another *coureur des bois*, appeared in Wisconsin, and for many years was the chief fur-trader of the region, wherein he had several stout stockades. For much of the time he acted for New France as "commandant of the West." Le Sueur, also a fur-trader captain, fortified the Bois Brulé-St. Croix route, and had stockades at La Pointe and on the Mississippi. For upwards of a century Wisconsin played an important part in the forest trade of New France, and Indians from here were largely used as allies of the French in the protracted struggle between France and England for the mastery of the continental interior.

The first permanent white settlement was made by the Langlade family at Green Bay, about the middle of the eighteenth century. At Prairie du Chien, at the junction of the Wisconsin river with the Mississippi, temporary hamlets of *voyageurs* often sprung up, but no permanent settlement was effected there until 1781. Traders were at Milwaukee as early as 1779, but it was not really settled until the trader Vieau's arrival in 1795; Portage and La Pointe trace an uninterrupted settlement to about the same date.

Notwithstanding the treaty of 1783, Great Britain retained possession of the forts on the upper lakes; and Wisconsin being a dependency of Mackinaw, it was practically under British control until the close of the war of 1812–15, although nominally U. S. territory after 1796. Early in the nineteenth century, as a means of helping Astor's fur company, Congress sought to exclude British traders from the district; but U. S. influence was not much felt until the close of the war, when the U. S. Government erected Fort Howard, opposite the then French and Indian village of Green Bay, and Fort Crawford at the fur-trading hamlet of Prairie du Chien. Up to this time the French and their half-bloods held Wisconsin woods and streams; and the fur-trade, in which they acted as agents and *voyageurs* for English firms at Mackinaw and Montreal, was the leading industry. Little by little this French predominance was undermined, at first by the advent of Americans into the lead mines (1827), and then by agricultural settlers from New England and New York State. The Black Hawk war (1832), wherein the Sacs were nearly exterminated, was also an important factor in the opening of the region. Settlement and development now began in earnest. The fur-trade, after the formation of Wisconsin Territory (1836), ceased to be of importance, the non-progressive French element subsided into insignificance, immigrants from the East were attracted by cheap lands on easy terms, and thenceforth Wisconsin was a U. S. Territory, in fact as well as in name, which rapidly grew into a powerful and patriotic State (admitted to the Union in 1848). In the war of 1861–65 Wisconsin took front rank on behalf of the Union, sending to the armies a ninth of her population and over half of her voters. Her death-roll was 12,301, or 16·6 per cent. of her total enlistment of 91,327, and her war expenses aggregated $11,704,932.55. The famous Iron Brigade was chiefly composed of Wisconsin men.

GOVERNORS OF WISCONSIN.

Territorial.	
Henry Dodge	1836–41
James D. Doty	1841–44
Nathaniel P. Tallmadge	1844–45
Henry Dodge	1845–48
State.	
Nelson Dewey	1848–51
Leonard J. Farwell	1852–53
William A. Barstow	1854–56
Coles Bashford	1856–57
Alex. W. Randall	1858–61
Louis P. Harvey	1862
Edward Salomon (acting)	1862–63
James T. Lewis	1864–65
Lucius Fairchild	1866–71
Cadwallader C. Washburn	1872–73
William H. Taylor	1874–75
Harrison Ludington	1876–77
William E. Smith	1878–81
Jeremiah M Rusk	1882–88
William D. Hoard	1889–90
George W. Peck	1891–94
William H. Upham	1895–97
Edward Scofield	1897–1900
Robert M. La Follette	1901–

AUTHORITIES.—The prime source of materials for the original study of early Wisconsin history is the *Wisconsin Historical Collections*, of which thirteen volumes have thus far been published by the State Historical Society. See also Thwaites's *Story of Wisconsin* (Boston, 1890). Strong's *History of the Territory of Wisconsin* (published by the State, 1885) is a compilation of territorial annals. Lapham's *Wisconsin* (1844; enlarged in 1846) is now out of print; so also are McLeod's *History of Wiskonsan* (1846); Smith's *History of Wisconsin* (published by the State, 1854, only vols. i. and iii. issued); and Tuttle's *Illustrated History of the State of Wisconsin* (1875). REUBEN GOLD THWAITES.

Wisconsin River: a river that rises in Vieux Desert Lake (which is partly in Michigan and partly in Wisconsin); flows in a generally south course to Portage City, Wis., where it turns to the S. W. It reaches Mississippi river 4 miles below Prairie du Chien. Breadth at its mouth, 1,800 feet; elevation, 600 feet. Its length is over 600 miles. It is navigable 200 miles to Portage City, whence a short canal leads to Fox river. The channel of the Wisconsin is much injured by shifting sandbars. The upper part of the river passes through heavy pine forests. Several cataracts, of which the most famous are those of the Dalles of the Wisconsin and Grandfather Bull Falls, break the course of this picturesque stream. Revised by I. C. RUSSELL.

Wisconsin, University of: an institution of higher learning, at Madison, Wis.; incorporated in 1838 and organized in 1848. In 1849 a preparatory department was established; in 1850 the university was formally opened; in 1851 the first college classes were formed. Congress in 1838 granted 46,080 acres of land to the Territory of Wisconsin for the support of a university, and in 1854 it made another grant of the same amount. In 1866 the university also received 240,000 acres of land which Congress had granted to the State in 1862 in accordance with the conditions of the Morrill Act. In 1889 this was supplemented by a grant which will ultimately amount to $25,000 a year. The university also has the income of the Hatch Act, appropriating $15,000 per annum for an agricultural experiment station. In 1867 the university was reorganized in accordance with the conditions of the grant. Since 1866 it has received generous State appropriations, among which were $50,000 in 1870 for the erection of the Ladies' Hall, and $80,000 in 1875 for the erection of Science Hall. The latter was burned in 1884, together with the apparatus and geological and other collections of great value. For the erection of new Science Hall and to replace apparatus, etc., the State appropriated, in 1885, $190,000, and $195,000 in 1887. For the benefit of the university there is levied annually a State tax of nine-fortieths of a mill on a dollar, which yields about $150,000. Besides this amount, the State provides $12,000 a year for the support of farmers' institutes, and 1 per cent. of the railroad-license tax, which yields about $13,000 a year, for the college of engineering. The entire income of the university in 1899 was $379,300. In 1893 a new building for the college of law was completed at an expense of $86,000, and in 1894 a gymnasium and armory at a cost of $116,000. The university domain consists of about 350 acres, extending a mile along the south shore of Lake Mendota. The university buildings are more than 20 in number, 10 being of stone and 6 of brick. The staff of instruction in 1894–95 consisted of 50 professors, 17 assistant professors, 25 instructors, 3 assistants, and 29 special lecturers. Students in the same year numbered: Fellows, 13; other graduates, 77; undergraduates in college of letters and science, 785; college of mechanics and engineering, 225; college of agriculture, 213; college of law, 266; school of pharmacy, 41—total, 1,530. In 1900 there were 160 professors and instructors, and 2,422 students. The general management of the institution is vested in a board of 14 regents—namely, the State superintendent of public instruction, the president of the university, and 12 members, one for each of the 10 congressional districts of the State, and two for the State at large, appointed for three years by the Governor. The president is chosen by the board of regents. The university comprises a college of letters and science; a college of mechanics and engineering; a college of agriculture; a college of law; a school of pharmacy; a school of economics, political science, and history; and a school of music. All the departments are open to women, the number in attendance in 1900 being about 400. C. K. ADAMS.

Wisdom, Book of: one of the Apocrypha of the Old Testament; written in Greek, apparently during the latter half of the second century B. C. It is a "wisdom" book, like the canonical books of Job, Proverbs, and Ecclesiastes, the New Testament book of James, and several of the Apocrypha. For greater effectiveness, the author speaks in the

name of Solomon. In the earlier copies of the Septuagint it is called the Wisdom of Solomon; but from the time when Jerome demonstrated that Solomon was not its author, his name has been generally omitted from the title. By Roman Catholics the book is regarded as canonical, on the same basis with others of its class. The Greek is more nearly classical than in most of the Apocrypha, and the contents, on the whole, of a high order. Among the numerous older commentaries on the book the most remarkable are by John Rainold (Oxford, 1618); Bauermeister (Göttingen, 1828); and Grimm (Leipzig, 1860). The best accessible Greek text is in Swete's *Old Testament in Greek*. An admirable translation and commentary is that of Dr. Bissell in the American Lange Series. Revised by WILLIS J. BEECHER.

Wise, DANIEL, D. D.: clergyman; b. at Portsmouth, England, Jan. 10, 1813; removed to the U. S. 1833; became a minister of the Methodist Episcopal Church; was editor of *The Sunday School Messenger* 1838–43, and subsequently of the *Ladies' Pearl*, *The Rhode Island Temperance Pledge*, and *Zion's Herald* 1852–56; was corresponding secretary of the Methodist Sunday-school Union 1856–72, and Tract Society 1860–72; and editor of Sunday-school and tract publications. Author of more than fifty volumes designed for youth, several under the pseudonym of Francis Forrester, Esq. D. in Englewood, N. J., Dec. 18, 1898.

Wise, HENRY ALEXANDER: Governor of Virginia; b. at Drummondtown, Accomack co., Va., Dec. 3, 1806; graduated at Washington College, Pennsylvania, in 1825; studied law at Winchester, Va., and then moved to Nashville, Tenn.; returned to his native county, where he continued the practice of law with great success, and soon became actively engaged in politics until the outbreak of the civil war. He was member of Congress 1833–43 and became noted for his vigorous but not always politic expression of his views. He favored the extension of slavery and the annexation of Texas. He was greatly attached to Henry Clay during this period of his life, and, it has been said, was a warm advocate of his nomination for the presidency in the election of 1840. He was influential in securing the nomination of John Tyler for the vice-presidency at that election. In 1843 Tyler nominated him minister to France, and he resigned his seat in the House in expectation of its confirmation, but the Senate, which was so decidedly at war with Mr. Tyler at this time, rejected the nomination. Wise was immediately returned to the House by his constituents. In 1844 Tyler nominated him minister to Brazil. This appointment was confirmed by the Senate. Resigning in 1847, he returned and took an active part in the presidential election in 1848. He was a Cass elector for his State. In 1850 he was a member of the reform convention of Virginia. In 1852 he was again presidential elector on the Pierce ticket. He was elected Governor of Virginia in 1855, and continued in the office until after the John Brown raid in 1859, Brown's execution being one of the last acts of his administration. Wise was decidedly opposed to secession in 1860, but he went with his State after her ordinance of secession. He entered the Confederate service with the commission of brigadier-general, which position he held until the close of the war. After the war he took no active part in politics, but changed his residence to Richmond, where he resumed the practice of law. He published *Seven Decades of the Union*, *Memoir of John Tyler* (1872). D. at Richmond, Va., Sept. 12, 1876. Revised by F. M. COLBY.

Wise, HENRY AUGUSTUS: naval officer; son of George Stuart Wise, U. S. navy; b. at Brooklyn, N. Y., May 12, 1819; entered the U. S. navy as a midshipman 1834; served on the coast of Florida during the Seminole war, and on the Pacific coast during the Mexican war 1846–48; married a daughter of Edward Everett: was flag-lieutenant of the Mediterranean squadron 1852–54; conveyed the Japanese ambassadors home in the U. S. frigate Niagara 1861; became assistant chief of the bureau of ordnance and hydrography, with the rank of commander, 1862; was promoted captain and chief of that bureau Dec., 1866; resigned his post 1868, and went to Europe for his health. D. at Naples, Italy, Apr. 2, 1869. He was the author of *Los Gringos, or an Interior View of Mexico and California, with Wanderings in Peru, Chili, and Polynesia* (New York, 1849); *Tales for the Marines* (Boston, 1855); *Scampavias, from Gibel-Tarek to Stamboul* (New York, 1857); *The Story of the Gray African Parrot*, for children (1859); and *Captain Brand of the Centipede* (London, 1860; New York, 1864), all under the pseudonym of Harry Gringo.

Wise, JOHN: clergyman; b. at Roxbury, Mass., in Aug., 1652; graduated at Harvard 1673; was settled as pastor at Chebasco, a new parish of Ipswich, 1683; was imprisoned, fined, and deposed from the ministry by order of Gov. Andros for remonstrating against a violation of charter rights in imposing a province-tax without authority from the Assembly (1688); brought a suit against Chief Justice Dudley for denying him the benefit of the Habeas Corpus Act (1689); was deputy from Ipswich in the Legislature of 1689, after the overthrow of Andros; was chaplain to the expedition against Quebec 1690; successfully opposed the scheme fathered by the Mathers for placing the churches of Massachusetts under the jurisdiction of ecclesiastical councils in his two essays, *The Churches' Quarrel Espoused* (Boston, 1710; 2d ed. with the "Cambridge Platform," 1715) and *A Vindication of the Government of New England Churches* (bound with a new edition of the former pamphlet, 1717). A large edition of both essays was printed in 1772, presumably as a political text-book; 4th ed., with historical notice by Joseph S. Clark, D. D., Boston, 1860. According to Dr. Clark "some of the most glittering sentences in the Declaration of Independence are almost literal quotations from the *Vindication*." Revised by S. M. JACKSON.

Wiseheart, GEORGE: See WISHART.

Wiseman, NICHOLAS PATRICK STEPHEN, D. D.: cardinal and archbishop; b. at Seville, Spain, Aug. 3, 1802, of Irish parents; educated at Waterford, at the Roman Catholic College near Durham, and in the English college at Rome; was ordained to the priesthood 1825; became Professor of Oriental Languages in the Roman university 1827, and rector of the English College 1828; returned to England 1835; established with O'Connell the *Dublin Review*, and delivered a course of lectures on Roman Catholic doctrines at St. Mary's, Moorfields, during Lent, 1836; maintained a polemic on the "Real Presence" with Dr. Turton, Bishop of Ely, and published several able works in advocacy of Roman Catholicism; lectured at Rome during Lent, 1837, at which time he induced Pope Gregory XVI. to appoint several additional vicars apostolic in England; was consecrated Bishop of Melipotamos *in partibus infidelium*, and coadjutor to Dr. Walsh of the Midland district of England June 8, 1840; became in the same year president of St. Mary's College, Oscott; visited Rome in 1847, and gave his influence in favor of the measure then preparing for the restoration of the Roman Catholic hierarchy in England; was appointed pro-vicar apostolic of the London district 1848, and vicar apostolic on the death of Bishop Walsh 1849; was summoned to Rome Aug., 1850: aided in preparing the "apostolic letter" of Sept. 29, re-establishing the English hierarchy; was nominated Archbishop of Westminster Sept. 30, and made cardinal Oct. 1, 1850—measures which caused great excitement in England, where they were characterized as a "papal aggression," and gave rise to the Ecclesiastical Titles Act, prohibiting the assumption of local ecclesiastical titles by Roman Catholics, and which remained nominally in force until its repeal in 1872. Cardinal Wiseman was active in the exercise of his new functions, making frequent episcopal journeys through England and Ireland, delivering lectures and speeches, and publishing numerous volumes in support of his doctrines. D. in London, Feb. 15, 1865. He was the author, among other works, of *Horæ Syriacæ* (Rome, 1828); *Lectures on the Connection between Science and Revealed Religion* (2 vols., 1836): *The Real Presence* (1836); *Lectures on the Doctrines and Practices of the Catholic Church* (2 vols., 1836); *Three Lectures on the Catholic Hierarchy* (1850); *Essays on Various Subjects* (3 vols., 1853); *Fabiola, or the Church of the Catacombs* (1855); *Recollections of the Last Four Popes* (1858); *Sermons* (2 vols. 1864); *The Witch of Rosenburg, a Drama in Three Acts* (1866); and *Daily Meditations* (1868). See the *Memoir* by G. White (1865) and Lord Houghton's *Monographs* (1873). Revised by J. J. KEANE.

Wishart, GEORGE: reformer and martyr; supposed to have been a native of Pittarrow, Forfarshire, Scotland; b. about 1513; taught Greek at Montrose; began preaching the doctrines of the Reformation about 1535; had to flee to England about 1538; resided and taught at Corpus Christi College, associating with Bilney, Latimer, and other Reformers; published several theological tracts in Latin; returned to Scotland July, 1543; began anew to preach at Montrose, Perth, Ayr, and Dundee, with such effect that in the latter town the populace destroyed the convents and churches of the Black and Grey Friars; made a preaching-

tour of the western counties; was arrested by the Earl of Bothwell at Ormiston; was tried for heresy at St. Andrews Feb. 28, before Cardinal Beaton's ecclesiastical court, composed of several bishops; condemned to the stake, and burned at St. Andrews Mar. 1, 1546. At the stake he predicted the death "within a few days" of the cardinal, who was a spectator from the castle, and the assassination of the latter about three months afterward is alleged to have been in pursuance of a plot to which Wishart was privy, the evidence being the mention of "a Scotchman called Wysshart" in a MS. account of the plot in the State Paper Office. See his *Life*, by Rev. C. Rogers (Edinburgh, 1876).

Wishart, or **Wiseheart**, George, D. D.: bishop; b. at Yester, East Lothian, Scotland, in 1609; educated at the University of Edinburgh; became a parish minister at North Leith and at St. Andrews; refused to take the covenant 1639, for which he was deprived of his living and imprisoned; made his way to Newcastle, England, where he preached, and was captured by the Scottish army Oct., 1644; was for some months imprisoned in the common jail at Edinburgh, suffering great hardships; succeeded in joining the celebrated royalist leader James Graham, Marquis of Montrose, to whom he became chaplain; escaped to the Continent 1646; returned to Scotland in the expedition of Montrose 1650, and narrowly escaped sharing his fate; became chaplain the same year to Elizabeth, the ex-electress-palatine and titular Queen of Bohemia; accompanied her to England at the Restoration 1660; became rector of Newcastle-upon-Tyne, and was consecrated Bishop of Edinburgh June 1, 1662. D. at Edinburgh in 1671. He was the author of a *History of the Wars of Montrose* (Paris, 1647), in elegant Latin, a copy of which was tied to the neck of the marquis at his execution. A second part, completing the history to the death of Montrose, was left by Wishart in MS., but was never printed in Latin. English translations of the valuable work were published in 1647, 1652, 1660, 1720, 1756, and 1819. Revised by S. M. Jackson.

Wish'oskan Indians: a linguistic stock of California Indians formerly occupying the shores of Humboldt Bay and the Eel, Elk, and lower Mad rivers emptying into it. The river settlements did not extend more than 40 miles up the streams, and the principal villages were around the bay. This people was one of the many who were designated by the whites as "Diggers." Their principal food consisted of roots, berries, nuts, and seeds, but they also depended much upon the salmon which ran up their rivers and which they knew how to cure. The natives of the coast also had recourse to mollusks and various other salt-water products. Their principal arms were the bow and arrow, with which, however, they are said not to have been very expert. Their chief industries were basket-making, the manufacture of nets for catching salmon, and of grass ropes for snaring deer and elk. They carried on a trade with the mountain tribes to the eastward, exchanging clams and seashells for acorns, pine-nuts, and grass for basket-making. For raiment the men used the skins of rabbits and deer, cut into strips and made into blankets or cloaks, while the women wore skirts of deerskin and robes for the upper part of the body. The principal tribes were the Patawat on lower Mad river and Humboldt Bay as far S. as Arcata, the Wiyot or Viard at the mouth of Eel river, and the Wishosk near the mouth of Mad river and on the northern part of Humboldt Bay. In 1853 the tribes of this family probably numbered 1,000 to 1,200 souls. They are now almost extinct.

Authorities.—Powers, *Tribes of California* (Cont. N. A. Eth., iii., Washington, 1877); H. H. Bancroft, *History of California*, vols. i.–vii. (San Francisco, 1884–90). See Indians of North America. J. W. Powell.

Wismar, *vis'mär*: town; in Mecklenburg-Schwerin, Germany; on a deep inlet of the Baltic, 20 miles by rail N. E. of Schwerin (see map of German Empire, ref. 2–G). It has an excellent harbor, ship-building docks, fisheries, breweries, distilleries, and manufactures of sailcloth, cordage, tobacco, and playing-cards. Its fortifications have been demolished, but a number of old houses still remain. It was founded in the twelfth century, incorporated in 1229, and formerly belonged to the Hanseatic League. Pop. (1890) 16,787.

Wista'ria [Mod. Lat., named from Dr. Caspar Wistar (1761–1818)]: a genus of climbing leguminous shrubs. *W. consequana*, a native of China, is one of the most beautiful spring flowering climbers. *W. frutescens* is a smaller ornamental species, growing wild in the western and southern parts of the U. S. in rich wet soils.

Wister, Annis Lee (*Furness*): translator and author; b. in Philadelphia, Oct. 9, 1830; married Caspar Wister, M. D., in 1854; has contributed to *Lippincott's Magazine*, and translated from the German several excellent novels, among which are Blum and Wahl's *Seaside and Fireside Fairies* (1864); E. Marlitt's *The Old Ma'mselle's Secret* (1868; 8th ed. 1870); *Gold Elsie* (1868); *The Countess Gisela* (1869); *The Little Moorland Princess* (1873); and *The Second Wife* (1874); Wilhelmine von Hillern's *Only a Girl, or a Physician for the Soul* (1870); Hackländer's *Enchanting and Enchanted, or Fairy Spells* (1871); Volkhausen's *Why Did he not Die?* (1871); Von Auer's *It is the Fashion* (1872); Fanny Lewald's *Hulda, or the Deliverer* (1874), and many others. She has written or translated over thirty books.

Revised by H. A. Beers.

Witchcraft: the cunning of a witch, i.e. of a man or woman who claims to compel supernatural aid. Religion seeks the sympathy and aid of supernal powers by rites open to all and approved by their fellows; witchcraft thinks to extort their help or baffle their wrath by divining and using their secrets. In this broadest sense it is identical with Magic (*q. v.*), and belongs to all times and lands. Old and very generally recognized, however, is a distinction between "white magic," which seeks its power by wisdom and uses it for worthy ends, and "black magic," which wins it by bargain with evil, and uses it in selfishness or malice. By witchcraft is commonly meant the latter, and especially that blackest but wholly imaginary sort, which was for centuries the nightmare of Christendom.

Born into an atmosphere of belief in magic, the early Church seems never to have questioned its reality, while she greatly broadened its scope by stigmatizing as magic all the marvels of rival faiths. Her monotheism and her identification of religion with ethics led her to look on the gods of the heathen as devils and on their worship as witchcraft. Her conversion of the Germanic peoples brought in a host of fresh demons; and it is the name of the seers of this northern faith, *witega*, *wicca*, which gives us the word *witch*. As the old paganisms faded away, however, the Church rose to a nobler rationalism. Great churchmen like Agobard of Lyons dared to question the popular superstitions, and the canon *Episcopi*, which from the ninth century was the voice of the canon law on this subject, denounced the believer in the witch fables as "an infidel and worse than a pagan." But when, in the thirteenth century, Thomas Aquinas gave its ripest form to the mediæval theology, the symmetry of his scheme seemed to demand for the devil an earthly following not less numerous or loyal than God's faithful, the Church, and bound to their master by similar ties of worship and service. Thus was postulated into existence, by a monkish logician, the "witch," as known to Christian history. For when, a little later, his fellow Dominicans of the Inquisition had by aid of the torture successfully rooted out the heretics, they turned their idle hands and their new instrument to the detection of these viler servants of Satan. It took, indeed, two centuries of inquisitorial sermon and treatise to convince the world of their existence; and not till the torture had forced from its victims, under the fruitful suggestion of their learned judges, what seemed confirmation of all the witch-lore of the classics, as well as of the demonologic suggestions of Holy Writ, did the persecution get fairly under way. But when, in 1484, the bull *Summis desiderantes* of Pope Innocent VIII. sanctioned the worst charges of the witch-hunters, and when to this was added by the German inquisitors, in their *Witch-Hammer* (1489), a code of rules which made detection certain and easy, the victory was won. The Reformation for a little distracted men's minds, but with its first lull, at the middle of the sixteenth century, the persecution burst forth with redoubled fury in all Christian lands, Catholic and Protestant alike, to rage for more than a century, and then smolder to our own day. The figures given for the total number of its victims are wildest guesswork, and those for many local persecutions are scarcely more reliable; but they are as likely to be below as above the truth. We have the names of hundreds who perished in single jurisdictions within the space of two or three years; and the records thus preserved are but chance fragments. No crime was more common. A single Lorraine judge boasted of having sentenced 900; and he was still in the midst of his activity. If the persecution knew fiercer epidemics in Catholic communities, it was more chronic in Protestant. Nor was it mainly old women who suffered. Such might be accused first, but the

witch was always tortured into naming her accomplices, and naturally she named those whom she hated or envied. Riches, learning, beauty, goodness were often so many titles to death. "There are still," wrote the chancellor of the Bishop of Würzburg to a friend in Aug., 1629, "four hundred in the city, high and low, of every rank and sex, nay, even clerics, so strongly accused that they may be arrested at any hour. Some out of all offices and faculties must be executed: clerics, electoral councilors and doctors, city officials, court assessors, several of whom Your Grace knows. There are law-students to be arrested. The Prince-Bishop has over forty students who are soon to be pastors; among them thirteen or fourteen are said to be witches. A few days ago a Dean was arrested; two others who were summoned have fled. The notary of our church-consistory, a very learned man, was yesterday arrested and put to the torture. In a word, a third part of the city is surely involved. The richest, most attractive, most prominent of the clergy are already executed. A week ago a maiden of nineteen was put to death, of whom it is everywhere said that she was the fairest in the whole city, and was held by everybody a girl of singular modesty and purity. She will be followed by seven or eight others of the best and most winsome. . . . There are children of three and four years, to the number of 300, who are said to have had intercourse with the devil. I have seen put to death children of seven, promising students of ten, twelve, fourteen, and fifteen. Of the nobles—but I can not and must not write more of this misery. There are persons of yet higher rank, whom you know and would marvel to hear of." Such, to quote but a single document, was the scope of the witch-persecution. Of the sufferings of its victims, and of the vile charges which blasted their fair names, it were better not to speak. Spain and Scotland were perhaps, next to Germany, the lands of its greatest severity. In England, despite the efforts of witch-hunting James II. and the reign of the Commonwealth, it never, for want of the torture, reached the same height as on the Continent; and in her colonies it was only at Salem in 1691–92, under the influence of Cotton Mather's *Memorable Providences*, that it became a panic.

Skepticism was never wanting, but the first open protest was that of the German physician Weyer, who published in 1563 his brave *De Præstigiis Dæmonum*. His book stirred up here and there a disciple, of whom the most rational was the Englishman Reginald Scot; but it roused adversaries far more numerous and influential, and it was the *Cautio criminalis*, published anonymously in 1631 by the young Jesuit poet Friedrich von Spee, that first gave the persecution pause by laying bare its cruelties and the part played in it by the torture. And it was reserved for the Dutch pastor Bekker to strike it in 1691 a yet deadlier blow by undermining, in his *Betooverde weereld*, the whole theory of human intercourse with the devil. The persecution lingered on, especially in lands where (as in Catholic Spain and South Germany, or in Protestant Scotland and Switzerland) a literal faith in the Bible had rooted it firmly in religion. "The giving up of witchcraft," wrote even the reformer John Wesley in 1768, "is in effect giving up the Bible." The latest legal witch-executions in Europe were at Kempten, Bavaria, in 1775, at Glarus, Switzerland, in 1785, and in the grand-duchy of Posen in 1793; but witches were judicially burned in Mexico as late as 1873.

The literature of the subject is vast, the greater part supporting the superstition. Graesse's *Bibliotheca magica* is still the only attempt at an exhaustive bibliography. The best survey of the subject in English is Lecky's chapter in his *Rationalism in Europe*. Wright's *Narratives of Sorcery and Magic* is more detailed, and Lowell's essay (in his *Among my Books*) is admirable for its terse insight. The most thorough history is Soldan's *Geschichte der Hexenprozesse*, revised by Heppe. Längin's *Religion und Hexenprozess* and Baissac's *Les Grands Jours de la Sorcellerie* add something, as does Mr. Lea's excellent chapter on sorcery in his *The Inquisition of the Middle Ages*. Michelet's brilliant and suggestive *La sorcière* is far too largely a work of the imagination. Of monographs on single episodes, Upham's on the Salem panic especially deserves mention here. GEORGE L. BURR.

Witch-elm, Wych-elm, or **Scotch Elm**: the *Ulmus montana*, a large fast-growing European elm, much planted for ornament and affording good timber. It is very hardy in the U. S.

Witch Hazel: See HAMAMELIS VIRGINICA.

Witebsk: See VITEBSK.

Witenagemot, wit'e-naă-ge-mōt [= O. Eng., assembly of wise men; *witena*, gen. plur. of *wita*, a wise man + *gemōt* (cf. Eng. *meet*), assembly]: the old Anglo-Saxon national council, the great court of justice and supreme legislative body of the English nation before the Conquest, superior to the *scir-gemot* or county assembly, and itself the offspring of the primitive *folk-mot*, an old Germanic institution. The ealdormen, the high ecclesiastics, and the great landholders as well as the higher shire officers, appear to have had seats in the *witan*, or witenagemot; and probably the freemen who lived near the place of meeting were allowed to sit in the assembly. It elected the king, observing, however, the principle of hereditary succession, though not necessarily choosing the eldest son, and it possessed the right of deposition. Its powers included the making of treaties, the appointing of bishops, the regulation of military and ecclesiastical affairs, the raising of revenue, etc., but its functions differed in different reigns and can not be clearly defined; nor is it easy to trace the descent of the later English Parliament from this council, though in some points there is a close resemblance. The witenagemot was abolished by William the Conqueror, who, however, had previously secured its acknowledgment of his title. See Stubbs, *Constitutional History of England*.

Wither, GEORGE: poet; b. at Brentworth, Hampshire, England, June 11, 1588; entered Magdalen College, Oxford, 1604; was called home "to hold the plow" without a degree 1607, but soon proceeded to London 1608; studied law at Lincoln's Inn; printed in 1613 a volume of metrical satires on the manners of the time, entitled *Abuses Stript and Whipt*, for which he was thrown into the Marshalsea prison, where he wrote his poem *The Shepherd's Hunting* (1615), and probably *Fidelia*. Among his other poems are *The Motto* (1618); *Philarete* (1622; *Hymns and Songs of the Church* (1623); and *Hallelujah* (1641). He is best known to modern readers by his song *Shall I, Wasting in Despair*, etc. He published many political and devotional pieces in prose and verse; served as captain of horse and quartermaster-general of a regiment in the expedition sent by Charles I. against the Scotch Covenanters 1639; sold his estate and raised a troop of horse for the Parliament 1642; was soon promoted to the rank of major; was commissioned by the Long Parliament a justice of the peace; was made by Cromwell "major-general of all the horse and foot in the county of Surrey"; profited largely by the confiscations of royalist estates, but had to surrender his acquisitions at the Restoration, when he was imprisoned three years in Newgate; was deprived of his library, and passed his last years in poverty. D. in London, May 2, 1667, and was buried in the Savoy church. Revised by H. A. BEERS.

With'erite: a mineral barium carbonate, of the composition $BaCO_3$, named after William Withering, an English physician and botanist (1741–99), who discovered it in 1784 in a lead mine in Cumberland, England. Its crystallization is right rhombic; it is almost as hard as fluor-spar. It has a white, gray, or yellow color. It is found at a locality near Lexington, Ky., and occurs so abundantly at Fallowfield, Northumberland, England, as to be mined largely, and sold for making plate glass and for chemical uses.

Witherspoon, JOHN, D. D., LL. D.: signer of the Declaration of Independence; b. at Yester, Haddingtonshire (East Lothian), Scotland, Feb. 5, 1722, said to be a descendant of John Knox; graduated at the University of Edinburgh 1742; was licensed to preach 1743; was parish minister of Beith in the west of Scotland 1745–57; joined the Pretender with a corps of militia at Glasgow; was taken prisoner at the battle of Falkirk, but released after two weeks' confinement in Donne Castle; became favorably known as a theologian by several learned treatises; was pastor of the Low church at Paisley from 1757 until 1768, when he accepted the presidency of the College of New Jersey, at Princeton, in which he was inaugurated Aug. 17, becoming also Professor of Divinity there and pastor of the church; identified himself with the interests of his adopted country, taking an active part in the political struggles of the time; was in 1776, the college being for a time broken up, chosen a member of the constitutional convention of New Jersey, and also of the Continental Congress, in which he sat for six years, being one of the signers of the Declaration of Independence and of the Articles of Confederation; opposed in Congress the repeated issues of paper currency, and showed great sagacity in anticipating political contin-

gencies; gave lectures on moral philosophy and rhetoric at the college, of which he greatly raised the reputation and improved the financial condition; visited England in 1783, and again in 1784, to collect funds for the college, with but slight success, the war being too recent; married for the second time, at the age of sixty-nine (1791), a young lady of twenty-three, and resided thenceforth on a farm near Princeton until his death on Nov. 15, 1794. He was totally blind during the last two years of his life. His two daughters by his first marriage married respectively Dr. David Ramsay, the historian, and Rev. Dr. Samuel Stanhope Smith, who succeeded him as president of the College of New Jersey. His *Works* were collected at New York (4 vols., 1800–01) and at Edinburgh (9 vols., 1804), edited with a *Memoir* by Dr. S. S. Smith; they comprise *A Serious Inquiry into the Nature and Effects of the Stage* (Glasgow, 1757); *Considerations on the Nature and Extent of the Legislative Authority of the British Parliament* (Philadelphia, 1774); and a series of essays on social and literary topics entitled *The Druid* (1781). His colossal statue was unveiled in Fairmount Park, Philadelphia, 1876. See *Proceedings and Addresses*, edited by W. P. Breed (Philadelphia, 1877). Revised by S. M. Jackson.

Withrow, William Henry, M. A., D. D.: author; b. in Toronto, Canada, Aug. 6, 1839; educated at Victoria College and Toronto University; was engaged in the itinerant and stationed ministry of the Methodist Church from 1864 till 1874; since the latter year has been editor of *The Methodist Magazine* published at Toronto. He has published the following among other books: *Catacombs of Rome* (New York and London, 1874); *History of Canada* (Boston and Toronto, 1878); *Lawrence Temple: a Tale* (New York and London, 1881); *Valeria the Martyr of the Catacombs* (New York and London, 1884); *Life in a Parsonage* (Toronto and London, 1885); *Men Worth Knowing* (1886); *Great Preachers, Ancient and Modern* (Toronto, 1886); *Worthies of Methodism* (1886); *Canada, Scenic and Descriptive* (1889); *China and its People* (1893). N. M.

Witness [orig. testimony, evidence < O. Eng. *witnes*, *gewitnes*, deriv. of *witan*, know; cf. Lat. *vide're*: Gr. ἰδεῖν, see]: in law, a person who testifies in a judicial proceeding as to the existence of facts material to the issue which is to be decided. In the different forms of trial known to the American and English law, such testimony may be given orally in open court, or it may be taken before some officer, reduced to the form of a written deposition, and read on the trial. It is well settled that originally the functions of the jury and the witnesses were not differentiated. Indeed, the jury was composed of persons of the vicinage, who were supposed to know the facts, the trial of which was committed to them, and who were sworn to find those facts according to such knowledge. It was only at a later date (probably about the middle of the fifteenth century) that the practice arose of producing witnesses to testify in open court to the jury. It is also probably true, as has been said, that "this feature of a jury trial, in our day so conspicuous and indispensable, was then but little considered and of small importance." In the Roman law no fact could be established by the testimony of less than two witnesses (a principle embodied in the maxim, *testis unus testis nullus*), and there is reason to believe that this principle was anciently recognized in England; but such a principle could hardly be expected to survive under a system where the witnesses were of so little importance relatively to the jury, and it is therefore an indirect result of that system that, "as a rule, no particular number of witnesses is required by our law."

As witnesses in court were always put under oath, they were of course always "required to have that amount of maturity, sense, and religious belief which the act of swearing presupposes." But other qualifications were added (many of them obviously derived from those required in the case of jurors) until the system became exceedingly complicated and inconvenient. The most important disqualifications are considered elsewhere. (See Evidence, *The Instruments of Evidence*; Married Women, *Incapacity to Testify*.) Most of these objections to the competency of witnesses have been removed by legislation. The accused in criminal prosecutions are still generally under a disability, though in many of the U. S. they are now permitted, if they choose, to testify in their own behalf. As all the State constitutions protect parties accused of crime from being compelled to furnish evidence against themselves, the prisoners can never be called as witnesses for the prosecution. It has been universally decided, however, that when the accused does become a witness, he may be cross-examined in the same manner as any other witness for the defense. Religious qualifications have been wholly swept away in a great majority of the States, as being inconsistent with their policy in respect to the separation between the state and religion.

Besides the rules concerning the competency of the witnesses themselves, there are others touching certain classes of facts from which they are either privileged or prohibited from testifying: (1) No one can be compelled to state matters which would tend to criminate himself or render him liable to a penalty. This is a personal privilege of the witness, which he must assert on his own behalf or may waive. (2) An attorney or counselor will not be suffered to disclose facts communicated by or learned from a client in the confidence of a business relation actually existing between them. (3) This rule, which the common law admitted only in the case of lawyers, has been quite generally extended by statute to physicians and to clergymen, who are forbidden to disclose facts discovered concerning their patients or their penitents through the means of their professional relations.

See Oath and Testimony; and consult Sichel on *Witnesses*; Best on *Evidence* (International edition); Stephen's *Digest of the Law of Evidence* (Chase's edition); Thayer's *Cases on Evidence* (chap. v.); Abbot's *Select Cases on Evidence*; and *Harvard Law Review*, v., 249, 295, 357.

George W. Kirchwey.

Witte, *vit'te*, Emanuel, de: painter; b. at Alkmaar, Holland, 1607. He was a pupil of Vanelst or Van Aalst. He matriculated at his guild at Alkmaar in 1636, and was living at Delft from 1642 to 1649. In 1650 he established himself at Amsterdam, where he painted architectural subjects and interiors with figures. He married in 1653. His works are to be found in the museums of Amsterdam, The Hague, Rotterdam, Brussels, Berlin, Weimar, Hamburg, Düsseldorf, and Brunswick, besides private galleries in England. Sir Richard Wallace's collection possesses a picture by de Witte, and also the National Gallery. D. at Amsterdam in 1692. He is said to have destroyed one of his master-pieces, the monument to Admiral Ruyter, as the latter's son-in-law refused to pay the price agreed upon for it. W. J. S.

Witt'ekind, or **Widukind**: the leader of the Westphalian Saxons in their wars with Charlemagne. When most of the Saxon chiefs submitted to Charlemagne at the Diet of Paderborn (777), Wittekind fled to Jutland, but returned in 778, while Charlemagne was in Spain, and renewed the war in the Rhine countries. Charlemagne hastened back to Germany, and Wittekind was once more compelled to flee to Jutland. In 782, however, he again returned, and annihilated a Frankish army in the Süntel mountain on the Weser. Charlemagne took a cruel revenge by massacring 4,500 Saxons at Verden on the Aller, but this cruelty occasioned a general rising of the Saxons under Wittekind and Albion. They were defeated, however, at Detmold and on the Hase in 783, and the two chiefs fled to Holstein. Nevertheless, in 785 a reconciliation took place between the emperor and his two great antagonists; they repaired to his camp at Attigny in Champagne, and were baptized, after which event their career is legendary. Of Wittekind it was said that the emperor made him duke of all the Saxons, and gave him Enger as his residence, and that he fell in 807, in the war against Gerold, Duke of Suabia. In 1377 the Emperor Charles IV. raised a monument to Wittekind in the parish church of Enger, where he is said to lie buried. In 1812 another monument was raised to him in Minden, Westphalia. See Diekamp, *Widukind der Sachsenführer* (1877).

Wittenberg, *vit'ten-bärch*: town; province of Saxony, Prussia; on the right bank of the Elbe; 55 miles S. W. of Berlin (see map of German Empire, ref. 3–G). It is famous as the place where the Reformation began. The houses of Luther, Melanchthon, and Lucas Cranach are still shown; also the spot, outside the Elster gate, where the papal bull was burned. Luther and Melanchthon are buried in the Schlosskirche. The university, once so famous, was incorporated with that of Halle in 1817. Breweries, distilleries, and tanneries are in operation, and woolen and linen goods manufactured. Pop. (1890) 14,458.

Wittrock, Veit Brecher, Ph. D.: botanist; b. at Skogsbol, province of Dalsland, Sweden, May 5, 1839; educated in the school at Wenersborg and the University of Upsala; Professor of Botany in the University of Upsala, then in the Bergian Institution, and also director of the Botanical Museum in Stockholm. He traveled extensively in Sweden,

Norway, England, Ireland, Germany, Austria, and Hungary in the study of the botany of these countries. His principal publications are *Försök till en Monographie öfver Algslägtet Monostroma* (1866); *Algologiska studier* (1867); *Om Gotlands och Ölands sötvattens-alger* (1872); *Prodromus monographiæ Œdogoniearum* (1874); *On the Development and Systematic Arrangement of the Pithophoraceæ* (1877); *On the Spore-formation of the Mesocarpeæ* (1878); *Om Linnæa borealis* (1878–79); *Ueber Schnee und Eisflora* (1883); *De Filicibus Observationes Biologicæ* (1891); etc. He is editor of *Acta Horti Bergiani*, and has issued *Erythrææ Exsiccatæ* (1884–90), and *Algæ aquæ dulcis Exsiccatæ*.

C. E. B.

Witwatersrand: See the Appendix.

Witzel, Georg: See Wicelius.

Woad [O. Eng. *wād*: O. H. Germ. *weit* > Germ. *waid*; from Teuton. are Ital. *guado*: O. Fr. *guaide* > Fr. *guède*]: a biennial herbaceous plant, the *Isatis tinctoria*, indigenous in Europe, which has been employed from the times of the Romans for dyeing blue. It is cultivated in France and Germany. The leaves possess a pungent odor and an acrid taste. These are either simply dried and sent to market, or by grinding are made into a paste, which is then prepared into balls and allowed to undergo fermentation, after which it is dried. Woad does not appear to contain either indigo-white or indigo-blue (see Indigo), its coloring qualities being due to the presence of a body termed *indican* ($C_{26}H_{31}NO_{17}$), which is converted into indigo-blue and *indiglucine* by the action of dilute acids. At present it is chiefly used for the reduction of indigo in the "woad-vats," but is seldom employed by itself for dyeing purposes.

Woadwaxen: See Dyer's Broom.

Woburn, woob′ŭrn: city; Middlesex co., Mass.; on the Boston and Maine Railroad; 10 miles N. W. of Boston (for location, see map of Massachusetts, ref. 2–H). Its plan is a thickly settled center, with three outlying villages and an area occupied by a small rural population. The general appearance of the center from the railway station is picturesque from the variety of the buildings, the curvature of the streets, and the several rocky elevations near. There are over 63 miles of streets, a public park, several squares, and a notable public library building, one of Richardson's most beautiful creations in stone, the gift of a private citizen, containing 33,203 volumes, 7,686 pamphlets, and 5,000 manuscripts, and having a collection of paintings, busts, and other objects of artistic and antiquarian interest. The birthplace of Benjamin Thompson (Count Rumford) is preserved intact by an association. The churches comprise 3 Baptist, 2 Roman Catholic, 2 (Trinitarian) Congregational, 2 Unitarian, 2 Protestant Episcopal, a Methodist Episcopal, a Scandinavian Evangelical Free church (Congregational), Salvation Army barracks, and All Saints chapel (Congregational). There are 51 public schools, a parochial school, and a private free industrial school—enrollment, public schools, 2,685: parochial, 404; industrial, 379—annual cost of public schools, $53,219. There is an endowed free lecture course for all citizens, and an incorporated home for aged women. The city receipts in 1894 were $614,306; expenditures, $598,981; net debt, $413,134; property valuation, $9,464,154. There are a national bank with capital of $200,000, a savings-bank with deposits of nearly $1,500,000, a co-operative bank, and a private banking-house. The manufacture of leather is the leading industry. There is an excellent supply of pure water from Horn pond, the largest sheet of water in the city's limits. Electric and horse railways connect the city with adjoining towns and cities. Woburn was the first town set off from Charlestown. The location was established in 1640, and the town was incorporated in 1642. Its territory then embraced the larger part of the present area of Woburn, and the towns of Winchester, Wilmington, and Burlington. In 1888 it became a city. Almost to the middle of the nineteenth century it was largely an agricultural town; railways and manufactures changed its character after 1835; and its growth since 1850 has been comparatively rapid. Pop. (1880) 10,931; (1890) 13,499; (1900) 14,254.

William R. Cutter,
Librarian, Woburn Public Library.

Woden, or **Wodan**: See Odin.

Wodrow, Robert: clergyman and author; b. at Glasgow, Scotland, in 1679; educated at Glasgow University, where he became librarian, and became in 1703 minister of Eastwood, Perthshire, where he died Mar. 21, 1734. He was the author of several works relating to Scottish history. Many of his MSS. are preserved in the Advocates' Library. "The Wodrow Society" was formed at Edinburgh in 1841 for the publication of the early writers of the Reformed Church of Scotland, and has published 24 volumes, of which the earliest consisted of Wodrow's *Correspondence* (3 vols., 1842–43), edited by Rev. Thomas McCrie. The New Spalding Club in 1890 published his *Biographical Collections relating to the Northeast of Scotland*. See his memoir in the new edition of his *History* and in the other works.

Revised by S. M. Jackson.

Wofford College: an institution at Spartanburg, S. C.; named for Rev. Benjamin Wofford, who gave $100,000, under the control and management of the conference of the Methodist Episcopal Church South of South Carolina. It was chartered by the Legislature of South Carolina Dec. 16, 1851, and the board of trustees held their first meeting to organize under it at Newbury Court-house Nov. 24, 1853, when they elected a president and four professors, who opened the institution for regular scholastic exercises Aug. 1, 1854. An ample curriculum of studies was prescribed. There are two literary societies—viz., the Calhoun and the Preston, the first organized Oct. 1, 1854, and the second Oct. 16, 1858, named respectively for Hon. John C. Calhoun and Hon. William C. Preston. The buildings were completed Jan. 1, 1855, and consist of a large and elegant college edifice, a president's house, and houses for six professors. They stand on a beautiful campus, inclosing 69 acres, within the corporate limits of the town of Spartanburg. The endowment of the college, originally ample, was almost entirely lost by the civil war, but the trustees and alumni society are making vigorous efforts to restore it and to promote the success of the institution. There were in 1900 10 instructors, 228 students, and a library of 10,000 volumes. Its president (1901) is James H. Carlisle, LL. D.

Wohlgemuth, or **Wolgemut**, *vōl′ge*-moot, Michael: engraver; b. at Nuremberg, Germany, in 1434. He was a pupil of James Valsch, and worked for Hermann Schedel, the compiler of the *Nuremberg Chronicle*. Some say he made the drawings only, the blocks being cut by others. He was the master in painting of Albert Durer. His pupils produced large altarpieces in his workshop, besides carving the adjuncts and church furniture generally. A large altarpiece in the Marienkirche at Zwickau is by him and is dated 1479; in the Vienna Gallery is a *St. Jerome* painted in 1511. Wohlgemuth was also a portrait-painter. D. at Nuremberg, Nov. 30, 1519. A portrait of him by Albert Dürer is in the Munich Gallery. Wohlgemuth is supposed to have been the author of the prints after Schöngauer, twenty-eight in number, signed with the letter W. He also made the designs for A. Hoberger's *Schatzkammer der wahren Reichthümer*, and for other works.

W. J. S.

Wojwode, woi′wōd [Pol. *wojewoda*, from *wojna*, war, and *wodrić*, to lead; Servian, *vojvoda*; Russ. *voevoda*]: a title exactly corresponding to German *Herzog*, duke, in its original meaning. It gradually became a dynastic title in Poland before the Piasts and of the Roumanian princes in Moldavia and Wallachia, until in 1716 the Turkish suzerain bestowed upon the elected prince the title of *hospodar* (Slav. master, lord). In the kingdom of Poland the title of Wojwode passed over to the administrative governors of the provinces, which were accordingly called Wojewódstwa. These well-nigh sovereign chiefs, like the old German dukes, governed their provinces in peace and accompanied the elective king with their army in case of war. Each had a seat and a vote in the senate, and they formed the first class of the secular state, holding equal rank with the archbishops; their Latin title was the princely name of *palatinus*. The title of Wojwode in its original meaning of leader in war still exists in Servia and Bulgaria. The Temeswar Banat in Southeast Hungary still bears the Slavic name of Wojwodina. The Polish Wojewódstwa (twenty-nine in number in 1772) were abolished in 1832 and changed into governments of the Russian Vistula provinces, as Poland is officially called.

H. S.

Wolcot, or **Wolcott**, John, better known as Peter Pindar: physician and satirical poet; b. at Dodbrooke, Devonshire, England, in May, 1738; served an apprenticeship of seven years to his uncle, a physician and apothecary at Fowey, Cornwall, who ultimately left him a considerable property; accompanied Sir William Trelawney, governor of Jamaica, to that island as his physician 1767; took orders in the Church of England, and obtained a curacy in Jamaica

in 1769, but returned to England on the death of his patron three years later; spent twelve years at Truro, Helston, and other towns in Cornwall as a physician; discovered the merits of the obscure painter Opie, with whom he went to London 1780; made himself conspicuous by his poetical productions, mostly satirical, which involved him in many quarrels. His attacks upon the king were so effective that at one time the ministry purchased his silence by the payment of £300 per annum. Among his satires are *Lyric Odes*; *An Epistle to the Reviewers*; *Peeps at St. James*; *Royal Visits*; and *The Lousiad*. A collection of these in four volumes was published in 1796. In his later years he became totally blind. D. at Somers Town, London, Jan. 14, 1819. Several editions of his collected *Works* (about seventy in number) appeared in his lifetime, the last in 5 vols. (1816).
Revised by H. A. Beers.

Wolcott, Edward Oliver, LL. B.: U. S. Senator; b. at Longmeadow, Mass., Mar. 26, 1848; served for a few months as private in the 150th Regiment, Ohio Volunteers, 1864; entered the class of 1870, Yale College, but did not graduate; subsequently received the degree of A. M.; graduated at Harvard Law School 1871; removed to Colorado to practice law; became extensively interested in silver mines; elected as a Republican to the U. S. Senate, 1888; re-elected 1894.

Wolcott, John: See Wolcot.

Wolcott, Oliver, LL. D.: signer of the Declaration of Independence; son of Gov. Roger Wolcott; b. at Windsor, Conn., Nov. 26, 1726; graduated at Yale College 1747; served as a captain of New York Volunteers on the Canada frontier 1748; studied medicine, but never practiced; was elected sheriff of Litchfield County 1751; became a judge of common pleas and of probate; was a member of the executive council 1774–86; commissioner of Indian affairs for the northern department 1775; took his seat in the Continental Congress Jan., 1776; signed the Declaration of Independence; commanded as major-general the fourteen Connecticut regiments raised for the protection of New York; joined Gen. Gates with several hundred volunteers, and was present at the battle of Saratoga, where he gained the rank of brigadier-general of the regular army; served in Congress, in the army, or on commissions throughout the war; was Lieutenant-Governor of Connecticut 1786–96, and Governor 1796–97. D. at Litchfield, Conn., Dec. 1, 1797.

Wolcott, Oliver, LL. D.; cabinet officer; son of the preceding; b. at Litchfield, Conn., Jan. 11, 1760; graduated at Yale College 1778; served as a volunteer to repel the British attack on Danbury 1777, as volunteer aide to his father 1779, and as an officer in the commissary department 1780–81; was admitted to the bar 1781; was employed in the financial affairs of the State government, and subsequently (1784) as a commissioner to settle its accounts with the U. S.; was comptroller of public accounts of the U. S. 1788–89, auditor of U. S. treasury 1789–91, comptroller 1791–95, Secretary of the Treasury 1795–1800, and judge of U. S. circuit court 1801–02; removed to New York city 1802; was a merchant there until 1812; took part with his brother Frederick in founding extensive manufacturing establishments at Wolcottville, near Litchfield; was president of the State constitutional convention 1817, and Governor 1818–27, after which he resided in New York, where he died June 1, 1833.

Wolcott, Roger: Governor of Connecticut; b. at Windsor, Conn., Jan. 4, 1679; was apprenticed to a mechanic, and never attended a school, but acquired a good education by private study; was commissary in the expedition of 1711 against Canada; served as an officer in subsequent wars with France, and was major-general and second in command at the capture of Louisburg 1745; was successively a member of the assembly and of the executive council, judge of the county court, deputy governor, chief judge of the superior court, and was governor of the colony 1751–54. D. at East Windsor, May 17, 1767. He published a volume of *Poetical Meditations* (New London, 1725), and a pamphlet on church government (Boston, 1761), and left a MS. poem of 1,500 lines entitled *A Brief Account of the Agency of the Honorable John Winthrop, Esq., in the Court of King Charles the Second, Anno Dom. 1662, when he obtained a Charter for the Colony of Connecticut*, which contains a detailed account of the Pequot war. It was printed in the collections of the Massachusetts Historical Society (1st series, vol. iv.).

Wolf [O. Eng. *wulf*: Germ. *wolf*: Goth. *wulfs*; cf. Gr. λύκος: Sanskr. *vṛka-*]: the common name for the larger wild species of the family *Canidæ* and genus *Canis* which most resemble the dog, and which agree with the ordinary types of that animal in the possession of circular pupils to the eyes and a somewhat bushy tail. The species are somewhat numerous, and the typical representatives are chiefly found in the northern hemisphere and southward to India; but allied species, which are properly called wolves, although more generally designated as wild dogs or foxes, are also found in Africa, South America, and Australia. They agree essentially in their habits with the dogs, and hunt their prey either by surprising or running it down. At some seasons of the year they live, to some degree, in solitude, although they often associate in packs; and especially is this the case in winter, when they combine in the pursuit of game and other objects of prey. In America there are two well-marked species: (1) The large common wolf (*Canis lupus*), identical with or a sub-species of the wolf of Europe and Northern Asia, and (2) the small prairie wolf or coyote (*Canis latrans*), occurring on the plains of the Western States and Territories. (1) The former has an average length of about 4 feet, with a tail of 17 to 20 inches: its color is generally grizzly gray above, but is quite variable, sometimes being black and sometimes white, and with various gradations between the two. These variations were formerly supposed to indicate specific differences, but as they are found in cubs of the same litter, they are now recognized as being not even of sub-specific or varietal importance. (2) The prairie wolf is about 3 feet long or somewhat longer, and has a tail about 16 inches in length. Its color, as in the wolf, is generally gray, but is subject to much less variation than in the former species. It is found more generally on the plains of the great West and in the hydrographical basins of the Missouri and Saskatchewan rivers, and extends southward into Mexico. It is quite prolific, sometimes having as many as ten in a litter. It lives mostly in burrows.
Revised by F. A. Lucas.

Wolf, *vōlf*, Christian, Baron: philosopher and mathematician; b. at Breslau, Silesia, Jan. 24, 1679; studied first theology, then mathematics and philosophy at Jena and Leipzig, and began to lecture in the latter city, but was compelled by the invasion of Saxony by Charles XII. in 1706 to leave the country, and received in the following year an appointment as Professor of Mathematics and Natural History at the University of Halle. Here his lectures attracted much attention and drew large audiences, and his writings, mathematical and philosophical, gained for him a great reputation all over Germany, but being opposed to the pietistical tendency which at that period characterized the University of Halle, he was formally accused of heresy by his theological colleagues, and by a cabinet order of Nov. 15, 1723, was ordered to leave Halle within twenty-four hours and the Prussian states within two days. He found refuge in Hesse-Cassel, and lectured for several years with great success at Marburg, but on the accession of Frederick II. he was recalled to Halle in 1740, made chancellor of the university in 1743, a baron in 1745, and died there Apr. 9, 1754. He wrote on mathematics, law, and all the various disciplines of philosophy, and he often issued his works in double editions —one in Latin and one (generally abbreviated) in German. His prominence in the history of philosophy is due more to his method than to his ideas; and indeed his method became universally employed, not only in philosophy, but in all sciences, up to the time of Kant. The characteristic of his method is usually known as "dogmatism," being mainly by definition and analytic statement with little resort to experience. See his *Autobiography*, edited by Wuttke (1841), and the works of Ludovici on his philosophy and its influence, together with the treatment of the *Histories of Philosophy*, by Fischer, Erdmann, and Ueberweg.
Revised by J. M. Baldwin.

Wolf, Edmund Jacob, D. D.: theologian; b. at Rebersburg, Center co., Pa., Dec. 8, 1840; educated in Pennsylvania College, the Theological Seminary, Gettysburg, and at Tübingen and Erlangen; entered the ministry 1865; pastor in Northumberland co., Pa., and Baltimore, Md.; in 1874 became Professor of New Testament Exegesis and Church History, Theological Seminary, Gettysburg; author of *History of the Lutherans in America* (New York, 1890); former editor of *The Quarterly Review of the Lutheran Church*, and at present (1895) one of the editors of *The Lutheran World* (Cincinnati, O.).
H. E. Jacobs.

Wolf, Ferdinand: Romance scholar; b. in Vienna, Dec. 8, 1796; studied philosophy and law, but more particularly literary history, and in 1819 was made secretary of the Academy of Sciences in Vienna. D. in Vienna, Feb. 18, 1866. His works, of which there is a long list, are marked by thoroughness of research and a fine critical perception. Especially to be noted are the *Floresta de rimas modernas castellanas* (Paris, 1837); *Ueber die Lais, Sequenzen und Leiche* (Heidelberg, 1841); *Rosa de romances* (Leipzig, 1846); *Studien zur Geschichte der spanischen und portugiesischen Nationallitteratur* (Berlin, 1859); *Histoire de la littérature brésilienne* (Berlin, 1863); and in collaboration with Hofmann, *Primavera y flor de romances* (2 vols., Berlin, 1856). In addition he contributed numerous articles to the *Jahrbücher der Litteratur*, published at Vienna, and supplied corrections and new matter to the German translation of Ticknor's *History of Spanish Literature*, for which he also prepared a supplement. J. D. M. Ford.

Wolf, Friedrich August: classical scholar; b. at Haynrode, Prussian province of Saxony, Feb. 15, 1759; studied classical languages at Göttingen, where, on Apr. 8, 1777, in spite of the strenuous opposition of the authorities, he insisted on inscribing himself as "studiosus *philologiæ*" (in place of *philosophiæ*). This date has generally been taken as the birthday of the new school of philology inaugurated by Wolf, but the traditional and still widely accepted statement that he was the first so to style himself has been disproved by the matriculation lists of the Göttingen University. On graduating he became a teacher at the seminary of Ilfeld in 1779; rector of the gymnasium of Osterode in 1782; Professor of Philosophy and Pedagogy at Halle in 1783–1807. During this time his extraordinary talent as a teacher, added to his worldwide renown as a scholar, made Halle the most famous seat of classical learning in Germany. Boeckh, Bekker, Buttmann, Bernhardy, and Heindorf, to mention only these, were among his great pupils. With his removal to Berlin University in 1807, in the foundation of which he had taken a conspicuous part, a change came over Wolf. Dissatisfied with his surroundings, and embittered by petty personal quarrels, his usefulness was considerably impaired and his bodily vigor broken. In 1824 he took a journey through Southern France for the sake of regaining his health, but died Aug. 8 at Marseilles. Wolf was the first to systemize and to define the scope of philology, or "Alterthumswissenschaft," to use his own favorite designation. It dealt, according to him, with the study of ancient life and thought in all its various political, social, economic, and intellectual phases as handed down to us in the literary, epigraphic, and monumental documents of the Greeks and Romans. (See his *Encyklopädie der Philologie*, ed. by Stockmann, Leipzig, 1831.) Among the writings that emanated from his prolific pen were his editions of Demosthenes's *Leptinea* (1790), with a valuable introduction; Plato's *Symposium, Apology, Phædo, Crito*; Hesiod's *Theogony*; Cicero's *Tusculan Disputations*; *Post reditum in senatu, De domo sua, De haruspicum responsis*, and *Pro Marcello*, all of which speeches Wolf unjustly regarded as apocryphal; Aristophanes's *Clouds*, with a famous German translation; *Litterarische Analekten* (4 vols.), with admirable sketches of classical scholars, that of Bentley being the most noteworthy; *Kleine Schriften* (2 vols.). But all these works are now but little read for their intrinsic value. Wolf's claim to immortality rests upon his *Prolegomena in Homerum* (1795), in which he attempted to prove that the *Iliad* and *Odyssey* are not the work of one author but of several. (See Volkmann, *Geschichte und Kritik der Wolfschen Prolegomena*, Leipzig, 1874). It is true that but few, if any, of Wolf's arguments are accepted at the present day; nor is it their originality, strictly speaking, that gives them permanent value, for in some of the most important he was anticipated by Vico and Wood. What gives to this treatise its monumental and epoch-making character is rather the brilliancy of its style, the consummate skill in which the information imbedded in the Homeric scholia, which had only recently been published by Villoison (*q. v.*), is here for the first time scientifically utilized and interpreted, and finally the influence which this iconoclastic treatise exerted upon methodical research in general. For Wolf's arguments and the "Homeric question" in particular, see the article Homer. The best estimate of Wolf is given by M. Pattison, *Essays* (vol. i., pp. 337–415). See also W. Körte, *Leben und Schriften Friedrich August Wolfs des Philologen* (2 vols., Essen, 1833); I. F. D. Arnoldt, *Friedrich August Wolf in seinem Verhältnisse zum Schulwesen und zur Pädagogik dargestellt* (2 vols.—vol. i., biography; vol. ii., technical part —Brunswick, 1861–62); Bursian, *Geschichte der klassischen Philologie in Deutschland*. Alfred Gudeman.

Wolf, Hieronymus: classical scholar; b. at Göttingen, Germany, Aug. 13, 1516; pupil of Camerarius and Melanchthon. After leading a life of many vicissitudes as a teacher, librarian, and secretary (at the house of Fugger in Augsburg), he finally secured the position of the director of a school at Augsburg in 1557, which he retained till his death Oct. 8, 1580. Wolf was one of the foremost Hellenists of the sixteenth century. His fame now rests upon his elaborate editions, with critical and exegetical notes and Latin translations, of Isocrates (Basel, 1570, fol.) and Demosthenes (Basel, 6 vols. fol.). He also edited a number of Byzantine historians (Zonaras, Choniatas, Nicephorus Gregoras, Laonicus, Chalcondylas), with Latin translations, thus inaugurating the study of Byzantine history in Germany. Still other editions are the *Encheiridion* of Epictetus; Cebes's *Pinax*; the pseudo-Platonic *Axiochos*; Plutarch's *Demosthenes* and *Cicero*; some of the astronomical treatises of Proclus, Porphyrius, and Hermes; a Latin translation of the non-lexicographical portions of Suidas; and verbose commentaries to Cicero's *Cato Major, Lælius, Paradoxa*, and *Somnium Scipionis*. See his autobiography in Reiske's *Oratores Græci* (vol. viii., pp. 742 ff.); G. C. Mezzer, *Memoria Hieronymi Wolfii* (Augsburg, 1862); Schmid, *Encyklopädie der Pädagogik* (vol. x., pp. 433–456); Raumer's *Historisches Taschenbuch* (pp. 339–389, 1830). Alfred Gudeman.

Wolfboro: town (incorporated in 1770); Carroll co., N. H.; on Lake Winnipiseogee, and the Boston and Maine Railroad; 10 miles S. of Ossipee, 45 miles N. E. of Concord (for location, see map of New Hampshire, ref. 6–G). It contains the villages of Wolfboro Center, North Wolfboro, South Wolfboro, East Wolfboro, and Wolfboro Falls; is a summer resort in an agricultural region; and has five churches, graded public schools, the Brewster Free Academy, public library, Memorial Hall, savings-bank, loan and banking company, gravity system of water-works, electric-light plant, a weekly newspaper, and manufactories of woolen goods, boots and shoes, furniture, carriages, shingles, and marble-work. Pop. (1880) 2,222; (1890) 3,020; (1900) 2,390.
Editor of "Granite State News."

Wolf-dog: a large variety of the domestic dog, allied to the shepherd's dog, now found almost exclusively in Spain, though formerly common in Ireland and Scandinavia. The name is also applied to a dog of any kind that is trained to protect sheep, etc., against wolves.

Wolfe, Charles: poet; b. at Dublin, Ireland, Dec. 14, 1791; studied at Winchester School; graduated at Trinity College, Dublin, 1814; was tutor there 1815–56; took orders in the Church of England 1817, and became curate of the parish of Donoughmore, Ireland. After a visit to the south of France he died of consumption at the Cove of Cork (now Queenstown) Feb. 21, 1823. His poetical *Remains, with a Brief Memoir of his Life* (1825; 8th ed. 1846), were published by Archdeacon John A. Russell. His *Ode on the Death of Sir John Moore* is one of the most beautiful of modern poetical compositions.

Wolfe, James: soldier; b. at Westerham, Kent, England, Jan. 15, 1726; son of Lieut.-Gen. Edward Wolfe; entered the army as second lieutenant at an early age; was present at the battles of Dettingen, Fontenoy, Falkirk, and Culloden; distinguished himself at Lafeld 1747, and at the siege of Maestricht 1748; commanded a regiment in the Highlands of Scotland 1749–54; was quartermaster-general in the expedition against Rochefort 1757, and brigadier-general in that against Louisburg, Cape Breton, 1758; was appointed by Pitt major-general and placed in command of an expedition for the conquest of Canada 1759; arrived with 8,000 men in the St. Lawrence in June; was repulsed by Montcalm in a first attack, July 31, and fell in the moment of victory in the battle on the Plains of Abraham, Sept. 13, 1759. He was buried at Greenwich, and monuments to his memory have been erected in Westminster Abbey and at Quebec. His *Life* has been written by Robert Wright (London, 1864). See also Parkman's *Montcalm and Wolfe* (1885).

Wolfe Island: an island township and post-village; at the outlet of Lake Ontario, directly opposite Kingston, Canada, and Cape Vincent, N. Y. It belongs to Frontenac County, Ontario, is about 18 miles long, and has a lighthouse. Pop. about 2,000, and diminishing.

Wolfenbüttel, *vŏlf'en-büt-tel*: town; in Brunswick, Germany; on the Oker; 7 miles by rail S. of Brunswick (see map of German Empire, ref. 3–E). It has an excellent library of 300,000 volumes, of which Lessing was librarian for some time, housed in a handsome building, several educational institutions, and manufactures of lacquered and japanned wares, paper-hangings, leather, and tobacco. It dates from 1046, and in 1193 and 1542 was besieged and taken. Pop. (1890) 14,480.

Wolff, ALBERT: sculptor; b. at Neu-Strelitz, Mecklenburg, Nov. 14, 1814; studied sculpture under Rauch, afterward in Rome, and was made Professor at the Academy of Fine Arts in Berlin 1866. He is especially celebrated for his equestrian statues, of which he produced a great number —Frederick William III. in Berlin, Frederick William IV. in Königsberg, Ernst August in Hanover, Frederick Francis I. in Ludwigslust, etc. D. in Berlin, June 20, 1892.

Wolff, ALBERT: journalist; b. at Cologne, Dec. 31, 1835, was educated in Paris for mercantile pursuits, and afterward studied in the University of Bonn, but finally devoted himself entirely to literature. After trying, with success, various literary branches in the German language, he settled in 1857 in Paris, became secretary to Alexandre Dumas, Sr., and began in 1859 to write for the Parisian papers, *Gaulois*, *Figaro*, *Charivari*, *L'Univers Illustré*, *L'Événement*, etc. Of those articles, which often produced a great sensation, he published various selections in book-form: *Mémoires du Boulevard* (1866); *Les deux Empereurs* (1871); *Victorien Sardou et l'Oncle Sam* (1873), etc. After the Franco-German war he became a French citizen. From that time till his death, Dec. 23, 1891, he contributed specially art criticisms to the *Figaro* and dramatic criticism to *L'Événement*. He also wrote some novels and farces.

Revised by A. G. CANFIELD.

Wolff, JOSEPH, D. D., LL. D.: missionary; b. at Weilersbach, near Bamberg, Germany, in 1795; son of a Jewish rabbi; studied at Stuttgart, Munich, and Weimar; was baptized into the Roman Catholic Church at Prague 1812; completed his education at the Universities of Vienna and of Tübingen, devoting himself to Oriental languages; went to Rome in 1816; was admitted as a student into the Roman College, and afterward into the College of the Propaganda, from which, however, he was expelled in 1818 for heretical opinions; went to London 1819; joined the Church of England; spent two years at Cambridge studying Oriental languages; was ordained as a missionary to the Jews Apr., 1821; made an extensive tour through the East; returned to England 1826; married Lady Georgiana Mary Walpole, daughter of the Earl of Orford, Feb., 1827; embarked in April upon another missionary tour: penetrated through Persia to Bokhara, and thence to Afghanistan, Kashmir, and the Punjaub; visited Southern India, Arabia, and Abyssinia, where he learned the Amharic language; returned to England 1834; revisited Abyssinia, Arabia, and India 1836; proceeded thence to the U. S., reaching New York in Aug., 1837; was ordained deacon in the Protestant Episcopal Church; lectured in the principal cities and preached before Congress; returned to England Jan., 1838; was ordained priest at Dublin; obtained the curacy, first of Linthwaite and afterward of High Hoyland, Yorkshire; made a second journey to Bokhara in 1843, at the instance of the British Government, to attempt the release or learn the fate of Col. Stoddard and Capt. Conolly; was himself imprisoned and condemned to death, but saved by the interposition of the Persian ambassador; returned to England 1845, and spent the remainder of his life as parish priest at Isle Brewers, Somersetshire. D. at Isle Brewers, May 2, 1862. He published, among other works, *Researches and Missionary Labors among Jews and Mohammedans* (Malta, 1835); *Journal of Missionary Labors* (1839); *A Narrative of a Mission to Bokhara* (2 vols., 1845); and an autobiography entitled *Travels and Adventures*, etc. (2 vols., 1860).

Revised by S. M. JACKSON.

Wolffian Body [named from Kaspar Friedrich Wolff, a German anatomist and physiologist (1733–94)]: the primitive kidney of vertebrates, the mesonephros of embryologists. In the lower vertebrates it is the chief excretory organ throughout life, but in reptiles, birds, and mammals it disappears during the embryonic stages, its place being taken by the true kidney. All that remains of it in the adult of these groups is the anterior end, which enters into connection with the reproductive organs. The Wolffian body arises as a paired organ from two longitudinal ridges in the dorsal part of the body cavity. In its primitive condition it consists of a series of transverse tubes connecting the body cavity with a longitudinal tube emptying near the vent. The number of these tubes increases, and in the human embryo the whole reaches its maximum about the seventh week, and in the sixteenth has almost disappeared. The best account of the structure in the higher vertebrates is by Mihalkowics in *Internationale Monatschrift für Anatomie und Histologie* (vol. ii., 1885). J. S. K.

Wolf-fish: a name given to the fishes of the family *Anarrhichidæ* and genus *Anarrhicas*, on account of the fierce aspect and large canine teeth. They are elongated, but stout fishes. The scales are rudimentary; the head has a steep profile; the mouth is widely cleft; the jaws armed with strong conical teeth in and toward the front, and with molars in two rows on the palate and sides of the lower jaw; the dorsal fin is long and sustained by flexible spines; the anal fin is less than half as long as the dorsal, and opposite the posterior half of that fin; the caudal is distinct from the dorsal and anal fins, and rounded behind; the pectorals are large; the ventrals absent. The species are peculiar to the northern seas. The best-marked, and possibly the only ones, are the *Anarrhicas lupus*, found on both sides of the Atlantic Ocean, and *Anarrhicas denticulatus* of Greenland. On the American coast the wolf-fish is found as far southward as Cape Cod, and occasionally even beyond. It is a very ravenous and ferocious fish, and with its powerful jaws can inflict a severe wound even on man. Although repulsive in its appearance, and rarely if ever eaten on the American coast, it is regarded as palatable or even excellent food in different parts of Europe. The skin is in some places used for bags and pockets. The wolf-fish occasionally attains a length of 6 or 7 feet. It mostly lives in deep water, but approaches the shore to deposit its spawn in May and June. This species is also called in various places sea-wolf and catfish, and in the Orkney islands swine-fish, on account of the movements of its nose, which are supposed to simulate those of a hog.

Wölfflin, *völf'leĕn*, EDUARD: Latinist; b. at Basel, Switzerland, Jan. 1, 1831; studied in his native city and at Göttingen; privat docent at Basel 1856; professor at a gymnasium in Winterthur in 1861; called to the University of Zurich in 1869, to Erlangen in 1875, to Munich in 1880. Wölfflin is the foremost representative, if not the founder, of the historical study of Latin syntax and lexicography; edited Ampelius (1854); Polyænus (2d ed. 1886); Publilius Syrus (1869); Livy, books xxi., xxii., xxiii. (school editions, repeatedly re-edited); Asinius Pollio, *De bello Africano* (with Miodónski, 1889). Among his works are his treatises on the style of Tacitus in the *Philologus* (1866–68); *Die Latinität des Afrikaners Cassius Felix* (1880); *Die allitterirenden Verbindungen der lateinischen Sprache* (1881); *Die Gemination im Lateinischen* (1882); *Lateinische und romanische Comparation* (1879); *Ueber die Aufgaben der lateinischen Lexikographie* (1882); etc. He is the founder, editor, and one of the chief contributors of the *Archiv für lateinische Lexikographie*. ALFRED GUDEMAN.

Wolfram [Germ. possibly *Wolfrahm*, the ancient name of the mineral being *spuma lupi*, wolf's spittle or froth (*rahm* signifying cream)]: mineral *tungstate of iron*, ferrous tungstate, O_4WFe, though usually containing also from 4 to 20 per cent. of manganous oxide. It is right rhombic; dark brown or black, with a reddish-brown streak; hardness between apatite and feldspar; luster metalloidal, sometimes slightly magnetic; specific gravity from 7·2 to 7·5. It is abundant with the Cornish tin ores and in many European localities; in America at Monroe, Conn., with native bismuth; Trumbull, Conn., with massive topaz; in Mecklenburg co., N. C., and a number of other localities. Molecularly considered, it is probably a variable mixture of *ferberite*, ferrous tungstate, and *hübnerite*, manganous tungstate (the latter being also right rhombic) crystallized together.

Wolf River: a river of Mississippi; rises in Marion County, and flows S. into St. Louis Bay, an arm of Mississippi Sound.—Another WOLF RIVER rises in Tippah co., Miss., and flows W. N. W. 100 miles, mostly in Tennessee. It reaches the Mississippi at Memphis.

Wolf River: a river of Wisconsin; rises in the northeast part of the State, flows southward, and after passing through Pewaugan Lake flows into Fox river. It is navigable 150 miles for small steamboats, and affords passage to a vast amount of timber.

Wolfsbane: See MONKSHOOD.

Wolgemut: See WOHLGEMUTH.

Wol'laston, WILLIAM HYDE, M. D., F. R. S.: chemist and physicist; great-grandson of William Wollaston; b. at East Dereham, England, Aug. 6, 1766; educated at Caius College, Cambridge; took the degree of M. B. in 1787; graduated in medicine 1793; began to practice at Bury St. Edmunds in 1789, but soon removed to London, where he was not successful, and abandoned the profession; devoted himself to scientific researches, especially to experiments in chemistry, mineralogy, and physics; became secretary of the Royal Society 1806; discovered the metals palladium and rhodium (1803), and a method of making platinum malleable, for which he was awarded the medal of the Royal Society Nov. 30, 1828, and by which he gained £30,000; was the first to detect the dark or Fraunhofer lines in the solar spectrum (1802), and to demonstrate the identity of galvanism and frictional electricity; constructed a sliding scale of chemical equivalents; invented the reflecting goniometer, the camera lucida, and the cryophorus for freezing water by means of its own evaporation; improved the construction of the microscope by means of the "Wollaston doublet" or compound lens; was the first to describe cystic oxide and three new compounds connected with the production of urinary calculi. He was chosen president of the Royal Society 1820. D. in London, Dec. 22, 1828. He presented to the Royal Society £1,000 for the encouragement of experiments. He published thirty-eight papers in the *Philosophical Transactions* (1797–1829). He may be considered the founder of modern British chemistry.

Wollstonecraft: See GODWIN, MARY WOLLSTONECRAFT.

Wolow'ski, LOUIS FRANÇOIS MICHEL RAYMOND: political economist; b. at Warsaw, Aug. 31, 1810; studied in Paris 1823–27; served in the Polish revolution of 1830; retired to Paris after its suppression; was naturalized in France in 1834; became Professor of Law at the Conservatoire des Arts et Métiers in 1839, and was a member of the Constituent Assembly of 1848, and of the Legislative Assembly of 1849, but retired from politics in 1851. He founded in 1833 the *Revue de Législation et de Jurisprudence*, and established the first Crédit Foncier bank in Paris. Among his works are *De l'Organisation du Travail* (1845); *De l'Organization du Crédit Foncier* (1849); *Les Finances de la Russie* (1864); *La Liberté commerciale et les Résultats du Traité de Commerce de 1860* (1868); *Le change et la circulation* (1869); and *L'or et l'argent* (1870). D. at Gisors, France, Aug. 4, 1876.

Wolseley, wŏŏlz'leĕ, GARNET JOSEPH, First Viscount Wolseley: soldier; b. near Dublin, Ireland, June 4, 1833; entered the British service as ensign Mar. 12, 1852; served in the Burmese war of 1852–53; with Sir John Cheape's expedition against the robber-chief Myattoon; in the siege of Sebastopol from Dec., 1854, to close of the war; in the suppression of the Indian mutiny of 1857–59; and in the war with China (1860). In 1870, in command of the expedition from Canada to the Red River territory, he suppressed the insurrectionary government at Fort Garry, and was created a knight of St. Michael and St. George for his services. In 1873 he was appointed governor of Gold Coast settlement, which had become involved in a war with the Ashantees, and as commander-in-chief of the British forces defeated the enemy's army, occupied and destroyed Coomassie, his capital, and the king's palace, and brought the war to a speedy and successful end. For these services he was made major-general, created K. C. B., and the thanks of Parliament and £25,000 were bestowed upon him; inspector-general of auxiliary forces 1874–76; governor of Cyprus in 1878 and of Natal in 1879; commander-in-chief of British forces in Egypt 1882, winning the battle of Tel-el-Kebir Sept. 13, 1882, which practically closed the war; was raised to the peerage as Viscount Wolseley, and was made general in 1882; in 1884–85 he was commander-in-chief in Egypt, and conducted operations for relief of Khartum, for which services he was highly honored. In 1888 he was appointed adjutant-general of the army; in 1890 was appointed commander-in-chief of the troops stationed in Ireland, with headquarters in Dublin; from Nov., 1895, till Oct., 1900, succeeding the Duke of Cambridge, he was commander-in-chief of the British army with limited powers. He is the author of several military works, including an exhaustive biography of the Duke of Marlborough, published in four volumes.

Revised by JAMES GRANT WILSON.

Wolsey, wŏŏl'zeĕ, THOMAS: cardinal; b. at Ipswich, Suffolk, England, Mar., 1471; was educated in Magdalen College, Oxford; studied theology; took holy orders, and received in 1500 the rectorship of Lymington, Somersetshire; was appointed a chaplain to Henry VII. 1505; went to Bruges in 1507 on a special diplomatic mission to the Emperor Maximilian and to Scotland the next year on a similar errand, and for his success was rewarded with the deanery of Lincoln 1509. Henry VIII. made him his almoner 1509, and soon employed him in the most important affairs. He made him Archbishop of York in 1514, Lord Chancellor of England in 1515, and showed him an almost unlimited confidence in all negotiations. Foreign princes courted his favor; the Emperor and the King of France sent him great presents and bestowed pensions on him; the pope created him a cardinal in 1515 and legate in 1519; and from this last year to his fall he acted as if he were really the ruler of England and one of the sovereigns of Europe. His income was royal, and so were his expenses. He built Hampton Court; he founded Christ Church College and seven lectureships at Oxford; he kept a household of from 500 to 800 persons, and showed himself in many ways a patron of science and art. In personal bearing he was haughty and arrogant toward his equals, exceedingly adroit in managing his superiors, and kind and generous toward his inferiors. Twice—on the death of Leo X. (1522) and again on that of Adrian VI. (1523)—the tiara seemed to be within his reach, but both times his plans were foiled by the intrigues of Charles V. and by the opposition of the French bishops. At last his ambition came into conflict with the king's passion. The king wished to be divorced by the pope from Catharine of Aragon, the aunt of Charles V., and Wolsey had to carry through the necessary negotiations; but this task, in any case difficult, proved impossible for a man who, for his own sake, had to tread cautiously and manage people with the greatest discretion. The negotiations seemed to be endless. The king lost his patience, and even began to distrust the cardinal. At last it was evident that he had hopelessly failed. The pope, under the domination of Charles V., refused to grant the divorce. Wolsey was opposed to Henry's marriage to Anne Boleyn, because it might endanger his own position at home by giving the widespread jealousy and enmity around him a firm center. At last Anne Boleyn demanded and obtained from the king the cardinal's dismissal in disgrace, and on Oct. 17, 1529, the great seal was taken from him and he left the court. He retired to his archbishopric, and seemed prepared to end his life in comparative obscurity. But the hatred of his enemies was not yet satisfied, and on Nov. 4, 1530, he was arrested at Cawood on a charge of high treason. He was conducted to London, but on the way thither he fell ill, and died at the monastery of Leicester, Nov. 29, 1530. His *Life* has been written by G. Cavendish (1641), J. Galt (1812), G. Howard (1824), C. Martin (1862), M. Creighton (1888). See Froude's *History of England* (vol. i., 1856) and Williams's *Lives of the English Cardinals* (1868). Revised by S. M. JACKSON.

Wolstan: See WULFSTAN.

Wolverene: a name of the GLUTTON (*q. v.*).

Wol'verhampton: town; in Staffordshire, England; 13 miles N. W. of Birmingham (see map of England, ref. 9–II). Besides a number of modern public buildings, the town-hall (1868), an art gallery (1885), etc., it contains St. Peter's church, a cruciform Gothic edifice, which, founded in 996 and rebuilt several times afterward, was restored in 1859–65. The town lies on the western outskirt of the rich mining districts of Staffordshire, which are covered by blast furnaces, forges, rolling-mills, foundries, and every other kind of contrivance by which iron ore is transformed into pig, railway, sheet, rod, hoop, and nail iron, and worked into boiler-plates, locks, hinges, axles, bolts, vises, anvils, and edge tools. Besides hardware, in which branch of manufacture Wolverhampton is one of the leading centers of the world, it has extensive manufactures of tinware, articles of papier-mâché, and japanned and enameled goods. The parliamentary borough returns three members. Pop. (1901) 94,179.

Wolzogen, *vōlt-sō'gen*, KAROLINE, von: author; b. von LENGEFELD, Feb. 3, 1763, at Rudolstadt, Germany; married as her second husband, in 1796, Baron von Wolzogen, chamberlain at the court of Saxe-Weimar. D. at Jena, Jan. 11, 1847. Her brothers were Schiller's fellow pupils in the Karlsschule of Stuttgart; her sister Charlotte became his wife; she herself was through the whole latter part of his life an intimate friend of his, and her book, *Schillers Leben*

(2 vols., 1830), is one of the most vivid and trustworthy pictures of him. In the field of pure imagination she gained reputation by her romances, *Agnes von Lilien* (2 vols., 1798) and *Cordelia* (2 vols., 1840), the first for a time considered a work of Goethe even by eminent critics. See *Litterarischer Nachlass der Frau Karoline v. Wolzogen* (1867).

Woman: See the Appendix.

Woman's Christian Temperance Union (in abbreviated form W. C. T. U.): an association formed for the purpose of unifying throughout the world the work of women in temperance and social reform. Its methods are preventive, educational, evangelistic, social, and legal; the time of prayer observed by its members is noontide; its badge is a knot of white ribbon; its watchwords are "Agitate! Organize." Its motto is "For God and home and every land."

The National Woman's Christian Temperance Union was organized in Cleveland, O., in 1874, and is the result of the great "women's crusade." It is now regularly organized in all the States of the Union, and in every Territory except Alaska. Its headquarters are in Chicago, Ill., where it has a temperance publishing-house which sends out about 135,000,000 pages annually, and has seven editors and 150 employees. This publishing-house is a stock company, and all its directors and stockholders are women, as is its business manager. The *Union Signal* is the organ of the society, and has an average circulation of 80,000. The Woman's National Temperance Hospital demonstrates the value of non-alcoholic medication. The Woman's Temperance Temple, which cost over $1,000,000, has been built in Chicago. There are about 10,000 local unions with a membership and following, including the children's societies, of about half a million. The Woman's Christian Temperance Union has forty-four distinct departments of work, presided over by as many women experts in the national society and in nearly every State. All the States in the republic except three have laws requiring the study of scientific temperance in the public schools, and all these laws were secured by the Woman's Christian Temperance Union, as were also the laws forbidding the sale of tobacco to minors. Most industrial homes for girls were secured through the efforts of this society, also the refuges for erring women; laws raising the age of consent and providing for better protection for women and girls have been enacted by many legislatures through the influence of the department for the promotion of social purity, of which the late president of the society, Miss Willard, was until 1895 superintendent.

The World's Woman's Christian Temperance Union was founded through the influence of the national society in 1883, and already has auxiliaries in more than forty countries and provinces. Its president was Frances E. Willard, and its vice-president at large, Lady Henry Somerset, of London. The white ribbon is the badge of all the Woman's Christian Temperance Union members, and is now a familiar emblem in every civilized country. A great petition is being circulated in all parts of the world against legalizing the sale of opium and alcoholics; 7,500,000 names have been secured, including endorsements of great societies, and the petition is to be presented to all the governments of the world by a commission of women appointed for that purpose. FRANCES E. WILLARD.

Womb [< O. Eng. *wamb*]: the uterus, the chief of the female sexual organs, in which conception takes place and the embryonic organism is retained during the period of gestation, and developed from step to step of fœtal growth until its birth as a living, independent individual. The womb (see Fig. 1 in article OVARIES) in healthy adult women is located in the abdominal cavity, in the median line of the pelvis: it has the bladder in front, the rectum behind; its position is one of slight anteversion—that is, its vertical axis is thrown slightly forward. It is a pear-shaped body, with base above, and measures about 3 to 3½ inches in length. It is chiefly muscular in structure; is hollow, having a small canal through its lower portion, the neck or *cervix uteri*, which widens into a triangular cavity within the body or broad base above. The length of this canal and cavity is usually 2½ to 3 inches. At the upper or basic end of the cavity the angles connect by small apertures with the Fallopian tubes, which bring the ovules from the ovaries to the uterus. The interior of the womb, both neck and body, is lined with mucous membrane, arranged in folds and rich in blood-vessels, and containing numerous glands. The substance of the organ comprises three distinct sets of muscular fibers—an external, middle, and internal layer—some of which are transverse or circular, others longitudinal, and others oblique. These give the organ a powerful contractility. The organ is retained *in situ* by ligaments and the cellular tissue surrounding it. It has attachments to the bladder in front, to the rectum behind, to the pelvic bodies on either side by the broad ligaments—to the ovaries by the ovarian ligaments. When in pregnancy the womb increases to accommodate the developing infant, its muscular fibers take on increased growth, and, following the expulsion of the child and placenta, these fibers contract in the direction of the several coats, as stated, and prevent hæmorrhage. By a slow process of involution or atrophy from disuse the womb gradually returns to its normal size. For details of its functions, see EMBRYOLOGY, OBSTETRICS, and OVARIES; for diseases to which it is liable, see STERILITY and UTERINE DISEASES.

Wombat: any marsupalian quadruped of the family PHASCOLOMYIDÆ (*q. v.*), of which only three species are known. The wombat is an animal of clumsy form and stout limbs, reaching a length of about 3 feet and a weight of 60 lb. The legs are short, but powerful, and the animals burrow readily. The general color is gray, lighter beneath. They are nocturnal in habits, feed on vegetables, and, as a rule, are easily tamed. The common wombat, *Phascolomys wombat*, is found in South Australia, New South Wales, and Van Diemen's Land. The broad-fronted wombat, *P. latifrons*, is a native of South Australia. F. A. L.

Women's Rights: those rights which are denied to women because of their sex, and to secure which organized effort is being made, namely, equal political rights with men, involving equal recognition in the laws and constitutions, in colleges, trades, and professions; equal honor in the Church and the state; the same code of morals in social life. Those who are laboring in behalf of woman's rights demand that there shall be no limitations to her sphere of action. Whatever she has the desire and capacity to do, she must be free to do. Men and women have the same sphere in the universe of possibilities, though as individuals they may have different duties in that sphere. Woman asks to be subject to the laws of her being, and not to male authority—the assumptions and superstitions of the past.

The Matriarchate.—During the early centuries woman reigned supreme, the arbiter of her own destiny, the protector of her children, the builder of all there was of home-life, of religion, and of government. The mother was all-sufficient; family descent and property were in her line; man's relations were promiscuous—no one knew or cared who his father might be. Down to a late period woman sat in the councils of peace and war, and even at the dawn of Christianity, as priestess, she took part in religious ceremonies. Her motherhood compelled the use of all her powers, and made her the great factor in civilization. This period was called the Matriarchate, or mother age. Traces of it can be found in early Egyptian, Aryan, German, and Persian history, all through the Middle Ages, and among some uncivilized tribes and nations to-day.

The Patriarchate.—The transition to the patriarchate, or father age, was marked by force, violence, slavery, and wars for conquest. As soon as man assumed authority, woman's position, not only in the home, but also in the Church and the state, was the subject of constant dispute, whether the right to the throne could be in the female line, or whether, as priestess, she could administer the ordinances. The Salic law of France prevailed in some countries, in others the more liberal policy of England. But all through the patriarchate women have retained some recognition in the laws and customs of continental Europe. The Roman civil law was in some points favorable to woman until touched by the icy fingers of the canon law, out of which grew the old common law of our Saxon fathers. Charles Kingsley said, "This will never be a good world for women until the last remnant of the canon law is swept from the face of the earth."

Under the common law of England the right of suffrage was a franchise attached to a freehold, and women as well as men were "freeholders." As far back as the time of William the Conqueror women were enrolled among the inhabitants as "householders" who were "burgesses" or voters. Down to the seventeenth century women voted for members of Parliament, and in earlier centuries sat in the councils of the state and Church as members. The right of women to the franchise was verified many times by the courts. Judge Charles B. Waite, of Chicago, says: "Of fourteen authors whom I have consulted, who have written treatises on the election laws of England, four only express

any doubt as to the common-law right of women to vote for members of Parliament." Women not only voted, but held important offices, as queen, queen regent, with power to declare war, high constable, keeper of the seal, member of Parliament, and other offices—some of which they hold today. They have always had some form of representation, as property-holders, in most European countries, the *feme sole* (widows and spinsters) voting in person, the *feme covert* (married women) voting by proxy, the husband casting one vote for himself and another for his wife. Thus the principle of woman suffrage has all along been recognized in most civilized nations.

Adverse Legislation in the United States.—The common law of England was brought to New England by the colonists of 1620. The word "male" was not found in any of the constitutions of the original thirteen States. Voters were designated as "persons," "freeholders," "inhabitants," "freemen," and, following English precedent, women voted. New York was the first State to narrow her constitution by inserting the word "male" (1778). Massachusetts followed (1780). The last States to make the change were Rhode Island (1842) and New Jersey (1844). If women had not exercised their right to vote during two hundred years, why was it necessary to introduce the word "male" at all? Many publicists still hold that they were disfranchised then only by implication. It is remarkable that a nation claiming to be a republic, based on universal suffrage, should be the first to deny representation to one-half the people on the ground of sex. Whether a majority of women voted or not when they had the right does not affect the question from a legal standpoint. Political rights are not lost by *non user*. In some of the Southern States Negro men do not vote, yet no one doubts their legal right.

Efforts made to secure Equal Suffrage.—From the foundation of governments there have been women in all countries who understood their political status. In more recent times Mercy Otis Warren and Abigail Smith Adams, of Massachusetts, and Hannah Lee Corbin, of Virginia, made their protests against the exclusion of women from representation in the new republic (1776). Madame Roland and Madame de Staël's political utterances in the French Revolution, Mary Wollstonecraft's *Vindication of the Rights of Women*, Frances Wright's lectures on *Political Equality*, both in England and America; and later Harriet Martineau's writings on *Political Economy* in England, Margaret Fuller's *Woman in the Nineteenth Century*, Judge Hurlburt's *Human Rights* in the U. S., Madame Anneke's influence in the German revolution, the novels of George Sand, Charlotte Brontë, Frederika Bremer, and Elizabeth Barrett Browning's *Aurora Leigh*—all prepared the way for the general uprising of women in all civilized countries.

The first organized effort made by women to recover their ancient rights was in the U. S. In 1848 Lucretia Mott and Elizabeth Cady Stanton called conventions in Seneca Falls and Rochester, N. Y. Strong resolutions and a "declaration of rights" were adopted, which were extensively noticed, denounced by the pulpit, and ridiculed by the press. These conventions were speedily followed by others in Ohio, Indiana, Massachusetts, and Pennsylvania, all making the same demands for political rights, for equal advantages of education, and for equal place and equal pay in the trades and professions. In 1850 a national committee was formed—Paulina Wright Davis, president; Lucy Stone, secretary; Wendell Phillips, treasurer—which called conventions in the different States until 1866, when the national association was organized.

Favorable Legislation.—New York was also the first State to legislate on the question. A bill introduced by Judge Hurtell in 1837 for the property rights of married women aroused general discussion. John Savage, chief justice of the Supreme Court, and John C. Spencer, one of the revisers of the statute laws of the State, assisted in framing the bill, which became a law in 1848. While this bill was pending Ernestine L. Rose and others circulated petitions through the State. Pennsylvania enacted a similar law in the same year, and the other States soon followed. During all these early years *The New York Tribune*, edited by Horace Greeley, was the only metropolitan paper that gave the question a fair hearing.

Legislation thus far had been confined to the several States, but in 1866 national action was demanded. The civil war, the emancipation of the slaves, and the reconstruction of the Southern States involved prolonged discussions, resulting in the thirteenth, fourteenth, and fifteenth amendments to the Constitution, under which it was claimed that women, as well as the slaves, were enfranchised. This being the opinion of able jurists, the national association sent a petition with 80,000 signatures to Congress, on which Hon. William Loughridge, of Iowa, and Hon. Benjamin F. Butler, of Massachusetts, made a minority report, asserting woman's right to vote under the fourteenth amendment. With this view Virginia L. Minor, of Missouri, who tried to register and was denied, sued the inspectors, while Susan B. Anthony, of New York, who registered and voted, was arrested, tried, and fined. The result of this denial by Congress and the Supreme Court was the demand for a sixteenth amendment forbidding disfranchisement on the ground of sex. Washington thus became the center for national conventions, and congressional legislation the future demand. An amendment to the national Constitution adopted by the legislatures of three-fourths of the States is the most speedy way to secure woman's enfranchisement. The national association has held annual conventions in Washington from 1869 to 1895, with hearings before congressional committees, whose minority and majority reports with the arguments of the women have been published by Congress, franked by members, and sent broadcast throughout the Union.

While demanding national action, much liberal legislation has been secured in the States. Propositions to amend their constitutions have been submitted by nine different legislatures—Kansas, 1867; Michigan, 1874; Colorado and Minnesota, 1877; Nebraska, 1882; Oregon, 1884; Rhode Island, 1886; Washington, 1889; South Dakota, 1890; and in Kansas again 1894—all of which were lost. During these years school suffrage has been granted by the legislatures of twenty-five States, municipal suffrage in Kansas (1887), and full suffrage in Wyoming (1869); and by popular vote full suffrage in Colorado (1893) and in Utah (1895).

In 1894 a constitutional convention was held in New York which aroused deep interest throughout the State and among a class of women who hitherto had taken no part in the movement. The result of their efforts was a petition containing 625,000 names asking for an amendment to the Constitution, striking the word "male" from Section I., Article 2, and thereby securing to women the right to vote on equal terms with men. The majority of the members not having thought on the subject, knew nothing of its merits, and a considerable number of women who were opposed to the movement protested against the enfranchisement of their sex, and did what they could to prevent it. The amendment was lost by a vote of 97 to 58.

Agitation in Great Britain.—Soon after the agitation began in the U. S. it started in England. *The New York Tribune*, containing a full report of the first convention in Massachusetts (1850), fell into the hands of Mrs. Taylor, the future wife of John Stuart Mill, and inspired her able essay in the *Westminter Review* on the enfranchisement of woman. This roused Mr. Mill to thought on the question. In 1867 in the House of Commons he moved an amendment to the Household Suffrage Bill to strike out the word "man" and substitute "person." He presented petitions from distinguished men and women, made an able argument, and secured 81 votes. Though the word "man" was retained in the Reform Acts of 1867–68, English women claimed their right to vote under them. In Manchester alone 5,345 women householders tried to register, but the courts decided against them. In 1869, by a motion of Jacob Bright, the ancient right of women householders to vote at municipal elections was restored. In 1882 Dr. Cameron carried a similar measure for the women of Scotland. In 1870 William E. Forster carried an educational bill which empowered women householders to vote at school board elections and to act as members of school boards. In 1883 the Married Women's Property Bill was passed, the result of the untiring efforts of Mr. and Mrs. Jacob Bright. In 1888 the County Council Franchise Bill became a law, which extended the suffrage to another large class of women. Since 1866 the agitation has been sustained by a central committee in London, with auxiliaries throughout the three kingdoms. Mammoth meetings have been held and petitions circulated. The largest (1874) contained 445,564 signatures. Women now (1895) in Great Britain vote for all officers except members of Parliament, and many women are elected on school boards and as poor-law guardians. Throughout Ireland they vote for poor-law guardians, in the seaport towns for harbor boards, and in the city of Belfast for municipal officers.

Political Rights enjoyed in other Countries.—In the provinces of Canada, Cape of Good Hope, Australia, the presidencies of Madras, Bombay, and other British colonies, women householders vote at all municipal elections. In the Isle of Man women gained full suffrage in 1881, in New Zealand in 1893, and in South Australia in 1895. In Russia women who are heads of families vote for all elective officers and on all local questions. In Asiatic Russia, wherever there is a Russian colony, the *mir* or self-governing village obtains and women householders vote. In Finland, Sweden, and Denmark they vote for all officers except members of parliament. In Norway women have school suffrage. In Austria-Hungary they vote (by proxy) at all elections, including those for members of provincial and imperial parliaments. In Italy widows vote (by proxy) for members of parliament. In Croatia and Dalmatia women vote at all elections in person. In France the women teachers elect women on the boards of education. At every change of dynasty in France there have been propositions to extend political rights to women. Though many able advocates, such as Condorcet, Legouvé, and Dumas, have pressed their claims they have been persistently ignored.

Thus far the discussion has been confined to woman's political status, because on that depends the recognition of all her civil rights. With the suffrage all the opportunities of life are available. Colleges and universities closed to girls were open to boys because they were prospective heirs in the Government, while all of woman's disabilities grew out of her disfranchisement. Her position in the industrial world was essentially changed by the introduction of machinery, emancipating her from the dependence of home life and giving a monied value to her labor. This taste of financial freedom gave women new confidence, and they began to establish themselves in business of their own as milliners, dressmakers, merchants, manufacturers, bankers, farmers, horticulturists, and owners of vessels. In addition to the higher position in the industrial world, women soon fitted themselves for a place in the professions by the study of art, science, literature, philosophy, and political economy in seminaries founded for girls and in colleges opened for coeducation. They are now teachers in the public schools, professors in colleges, public lecturers on civil and parliamentary law, popular lyceum speakers, and most efficient organizers in the charities and the churches.

In 1876, the year of the Centennial celebration in the U. S., the supporters of suffrage reform were especially active. A protest against calling the Centennial a celebration of the people while one-half were denied all representation was issued by the Washington convention of that year and presented to Congress. The national association issued a declaration of rights, which was presented before a great assembly in Independence Square.

The first International Council of Women, held in Washington, D. C., 1888, was called and conducted by the National Suffrage Association—Elizabeth Cady Stanton, president—at a cost of $13,000. This brought together women from every civilized country engaged in every variety of public work. The convocation continued through eight days. An international council was organized to meet once in five years, and a national council to meet once in three years. The most remarkable feature of the World's Columbian Exposition in Chicago (1893) was the responsible position assigned to women in its administration. Congress appointed a "board of lady managers" and made an appropriation of $300,000, to be used at their discretion in the different departments of woman's exhibits; women were also appointed on the general committees, and served with men as judges of awards. Of all the great assemblies in the Art Palace (1893) the most wonderful was the "congress of representative women," to which all civilized nations sent delegates, and in which all questions involving the interests of domestic as well as public life were freely discussed during eight consecutive days. The many rights already conceded herald the dawn of a new civilization in which woman, as the chief factor in the development of the race, must be crowned with new dignity, honor, and power in the government. We have passed through the matriarchate, and are now approaching the close of the patriarchate, gathering our forces for another step in progress, which will bring us to the amphiarchate, the combined rule of man and woman.

References.—Bachofen's *Das Mutterrecht* (1861); Morgan's *Ancient Society* (1877); Wilkeson's *Ancient Egypt* (1836); Karl Pearson's *Ethics of Free Thought* (1888); Theodore Stanton's *Woman Question in Europe* (1882); *International Council of Women* (Washington, D. C., 1888); *Congress of Representative Women* (Chicago, 1893): Prof. M. Oskogorski's *Rights of Women* (1893); *The History of Woman Suffrage* (1884); Dr. Mary Putnam-Jacobi's *Common Sense Applied to Woman Suffrage* (1894). Women's newspapers: *The Revolution* (1868–71); *The Legal News* (1869); *The Ballot-Box and National Citizen* (1876–81); *The Woman's Journal* (1870); *The Woman's Tribune* (1882).

Elizabeth Cady Stanton, Susan B. Anthony.

Wonders, Seven: See Seven Wonders of the World.

Wood [M. Eng. *wode, wude* < O. Eng. *wudu, wiodu*: O. H. Germ. *witu*: Icel. *viðr*]: the hard and compact or tough and fibrous parts of higher plants, chiefly composed of fibrous and vascular tissue. It is found in the stems and roots, while those woody fibers which are obtained from the inner bark of dicotyledonous plants or from the midrib and veins of the leaves of monocotyledons, and which are so valuable in the arts, are not, strictly speaking, wood. Annual plants usually contain little woody fiber; they are chiefly composed of parenchymatous tissue, which also forms the great part of many herbaceous perennials and of all plants in a very young state. Wood is valuable not only as timber and fuel, being in many parts of the world the chief, if not the only, fuel, but to the woody fiber we are also indebted for cordage, many textile fabrics, ets., and, reduced to pulp, it is used for the manufacture of paper. A kind of factitious or artificial wood used for making ornamental articles was invented in France, and is known under the name of *bois duré*. It is formed of sawdust heated to a high temperature and subjected to a very great pressure. Its compactness and hardness exceed those of wood itself. See Fiber; Forestry; Fuel; Histology, Vegetable; Preservation of Timber, and Timber and Timber Trees.

Revised by Charles E. Bessey.

Wood, or **à Wood**, Anthony: antiquarian; b. at Oxford, England, Dec. 17, 1632; studied at Merton College, Oxford; took his degree 1652; devoted most of his life to the collection of data illustrative of the history of Oxford University. D. at Oxford, Nov. 29, 1695. He was the author of *Historia et Antiquitates Universitatis Oxoniensis* (2 vols. folio, 1674), being a translation from Wood's original *History and Antiquities of the University of Oxford*, which appeared in 5 vols., 1786–96, and of *Athenæ Oxonienses: an Exact History of all the Writers and Bishops who have had their Education in the Most Ancient and Famous University of Oxford, 1500–1695, with the Fasti or Annals of the said University* (2 vols. folio, 1691–92). For his strictures on the Earl of Clarendon, Wood was expelled from the university and his book burned shortly after its publication. A second edition, with 500 new *Lives*, was edited by Tonson (2 vols., 1721), and a third edition was carefully superintended, with extensive *Additions and a Continuation*, by Rev. Philip Bliss, D. C. L., fellow of St. John's College, Oxford (4 vols., 1813–20). A fourth edition was projected by the short-lived Ecclesiastical History Society, and for it Dr. Bliss wrote vol. i., embracing the *Life of Wood* (1848), but the project was not further carried out, though abundant materials were left by the editor to the Bodleian Library. Wood's *Life and Times, described by Himself*, first published 1730, was edited by Andrew Clark for the Oxford Historical Society, and published at Oxford (5 vols., 1891–95). His *State of the City of Oxford* (1773), by the same editor, appeared (3 vols., 1889–95) under the same auspices.

Revised by S. M. Jackson.

Wood, De Volson, A. M.: engineer; b. at Smyrna, N. Y., June 1, 1832; graduated at the State Normal School, Albany, 1853; taught mathematics in that Institution 1854–55; graduated at the Rensselaer Polytechnic Institute, Troy, 1857; was Professor of Civil Engineering in the University of Michigan 1857–72; from 1872 to 1885 Professor of Mathematics and Mechanics in the Stevens Institute of Technology, Hoboken, N. J.; since 1885 Professor of Engineering in the same institution; inventor of a steam-pump, a steam or pneumatic rock-drill, air-compressor, etc.; brought out revised editions of Mahan's *Civil Engineering* and of Magnus's *Lessons in Elementary Mechanics*; furnished many articles on engineering and on mathematical subjects to the *Journal of the Franklin Institute* and other periodicals; and was author of *A New System of Alligation* and of treatises *On the Resistance of Materials, Bridges and Roofs, Elements of Analytical Mechanics, Elementary Mechanics, Coordinate Geometry, Trigonometry, Thermodynamics, Reaction Motors*, etc. D. in Hoboken, N. J., June 27, 1897.

Wood, Eleazer Derby: soldier; b. in New York in 1783; graduated at the U. S. Military Academy Oct. 30, 1806, and appointed a second lieutenant in the Corps of Engineers; assisted in the construction of Castle Williams, Governor's Island, N. Y., and of Fort Norfolk, Va. During the war with Great Britain he served with Gen. Harrison's Northwestern army during the memorable siege of Fort Meigs, where he conducted the defense, and was engaged in the sortie of May 5, 1813; was in command of the artillery at the battle of the Thames Oct. 5. Transferred to the Northern army in 1814, he was engaged in all the events of that campaign, including the capture of Fort Erie July 3, the battle of Chippewa July 5, and that of Niagara, or Lundy's Lane, July 25. In the repulse of the assault on Fort Erie Aug. 15, Col. Wood led the Twenty-first regiment of infantry, and in the sortie of Sept. 13, 1814, he fell almost at the outset at the head of a column of which he was in command. For distinguished services in the defense of Fort Meigs he was breveted major, and lieutenant-colonel for gallantry in the battle of Niagara. His commanding general (Brown) erected a monument to his memory at West Point.

Wood, Ellen (*Price*), better known as Mrs. Henry Wood: novelist; b. at Worcester, England, Jan. 17, 1814; lived many years in France; contributed to many periodicals. She became editor of the *Argosy* magazine in 1867; published upward of thirty popular novels, among which are *East Lynne* (1861); *The Channings* (1862); *The Shadow of Ashlydyat* and *Verner's Pride* (1863); *Johnny Ludlow* stories (1874, 1880); *Count Netherleigh* (1881); and *About Ourselves* (1883). D. Feb. 10, 1887.

Wood, George Bacon, M. D., LL. D.: physician and author; b. at Greenwich, N. J., Mar. 13, 1797; graduated at the University of Pennsylvania 1815, and at its medical school in 1818; was Professor of Chemistry in the Philadelphia College of Pharmacy 1822–31, and of Materia Medica 1831–35; professor of the same branch in the University of Pennsylvania 1835–50, and of Theory and Practice of Medicine 1850–60; was physician in the Pennsylvania Hospital 1835–59; became president of the American Philosophical Society 1859; was long president of the College of Physicians of Philadelphia, and in 1865 endowed an auxiliary faculty of medicine in the University of Pennsylvania. He was the author of *A Treatise on the Practice of Medicine* (2 vols., 1847; 5th ed. 1858); *Therapeutics and Pharmacology* (2 vols., 1856; 3d ed. 1868); and *Lectures and Addresses on Medical Subjects* (1859). With Dr. Franklin Bache he prepared *The Dispensatory of the United States* (Philadelphia, 1833; 13th ed. 1870). D. in Philadelphia, Mar. 30, 1879. Revised by S. T. Armstrong.

Wood, Mrs. Henry: See Wood, Ellen (*Price*).

Wood, Gen. Sir Henry Evelyn: soldier; b. at Cressing, England, Feb. 9, 1838; entered the navy 1852; about 1856 entered the army in which he served with distinction in the Indian mutiny, the Ashantee, Zulu, and Transvaal wars; commanded the second brigade in the Egyptian expedition of 1882; commander-in-chief of the Egyptian army Dec., 1882; commanded the line of communication in the Nile expedition 1884–85; since 1886 has held home appointments and was appointed quartermaster-general to the forces in 1893. See the *Life* by Charles Williams (1892).

Wood, Horatio C., M. D., LL. D. (Yale): physician and author; b. in Philadelphia, Pa., Jan. 13, 1841; graduated in medicine at the University of Pennsylvania 1862, and became Professor of Medical Botany and afterward of Therapeutics; also Clinical Professor of Diseases of the Nervous System in that institution. He is the author of numerous papers on myriapods, *Scorpionidæ*, *Phalangidæ*, botany of the coal periods, and on fresh-water Algæ in the *Proceedings* and the *Transactions* of the Academy of Natural Sciences of Philadelphia, of the American Philosophical Society, and of the Essex Institute; also of *The Fresh-water Algæ of North America* in the Smithsonian *Contributions to Knowledge* (1873), of numerous original physiological and clinical investigations upon Indian hemp, nitrite of amyl, *Veratrum viride*, hyoscine, ergot, chorea, the pneumogastric nerves, etc., in the *Proceedings* of the American Philosophical Society, and in the medical journals of the U. S., England, Germany, and France; gained various prizes for original research, among them the Boylston prize by his *Essay on Thermic Fever or Sunstroke* (Philadelphia, 1872), and has published *A Treatise on Physiological Therapeutics* (1874; 9th ed. 1894); *A Study of Fever* (1875) in the Smithsonian *Miscellaneous Collections*: also *Nervous Diseases and their Diagnosis* (Philadelphia, 1887); has been chief editor of the *United States Dispensatory*, 15th, 16th, and 17th editions. Revised by S. T. Armstrong.

Wood, John George, F. L. S.: writer on natural history; b. in London, England, in 1827; educated at Ashbourne grammar school; became Jackson scholar at Merton College, Oxford; graduated 1848; was attached for two years to the anatomical museum at Christ Church, Oxford; took orders in the Church of England 1852; became chaplain to the Boatman's floating chapel, Oxford; was assistant chaplain to St. Bartholomew's Hospital, London, 1856–62; was examiner for the natural history university prize at Oxford 1855–57, and became in 1868 precentor of Canterbury diocesan choral union; was author or editor of numerous popular works on all the branches of natural history, many of them written for children; was editor of *The Boy's Own Magazine* and *Every Boy's Magazine*, and contributor to several prominent periodicals. His most important works are *The Illustrated Natural History* (3 vols., 1859–63; new ed. 1865–66), with 1,500 original illustrations; *The Natural History of Man* (2 vols., 1868–70), richly illustrated; *A Popular Natural History* (1866); *Homes without Hands, being a Description of the Habitations of Animals* (1864–65); *Bible Animals* (1869); *The Modern Playmate: a Book of Games, etc.* (1870); *Man and Beasts, Here and Hereafter* (2 vols., 1874); *Horse and Man* (1886). D. Mar. 4, 1889.

Wood, Leonard: See the Appendix.

Wood, Thomas Jefferson: soldier; b. at Munfordsville, Ky., Sept. 25, 1823; graduated at U. S. Military Academy July 1, 1845; served in the Mexican war and on frontier duty in Texas 1849–55. Promoted to be major Mar. 16, lieutenant-colonel May 9, 1861, he was employed in organizing and mustering Indiana volunteers until Oct. 11, when appointed a brigadier-general of volunteers, and Nov. 12 attained the colonelcy of the Second U. S. Cavalry; commanded a division of the army of Gen. Buell in the second day's fight (Apr. 7, 1862) at Shiloh and at siege of Corinth; of the Army of the Ohio at Perryville; of the Army of the Cumberland at Murfreesboro, where wounded, and at Chickamauga; of the Fourth Corps at Missionary Ridge and march to Knoxville, and in the numerous battles in Sherman's Georgia campaign in 1864 from Dalton to Lovejoy's Station, Sept. 2, where severely wounded; took part in opposing Gen. Hood's advance into Tennessee; succeeded to the command of the Fourth Corps, which he led in the battle of Nashville and pursuit of Hood to the Tennessee river. For gallant conduct at Chickamauga he was breveted brigadier-general, and for Nashville major-general. He was placed on the retired list June 9, 1868, with rank of major-general, but by act of Congress of 1875 he was reduced to brigadier-general. Revised by James Mercur.

Wood, Thomas Waterman: painter; b. in Montpelier, Vt., Nov. 12, 1823; studied painting with Chester Harding, and at a later time went to Europe for several years. In 1867 he took up his residence in New York. He was president of the American Water-color Society from 1878–87. The National Academy of Design received him as an associate in 1867, as an academician in 1871. He was elected vice-president in 1878 and president in 1889. Three of his pictures, *The Contraband*, *The Recruit*, and *The Veteran*, belong to the Metropolitan Museum of Art.

Woodbine: a name given in Europe to the honeysuckle, *Lonicera periclymenum*, and in the U. S. to the Virginia creeper. See Honeysuckle and Ampelopsis.

Woodbridge: township; Middlesex co., N. J.; on Staten Island Sound, and the Cent. of N. J. and the Penn. railways; 10 miles N. E. of New Brunswick, the county-seat, and 25 miles S. W. of New York, with which it has regular steamboat connection (for location, see map of New Jersey, ref. 3–D). It contains several villages, and has 5 churches, high school, public library, 3 weekly newspapers, large deposits of fire-clay, and fire-brick, tile, and drain-pipe works. Pop. (1880) 4,099; (1890) 4,665; (1900) 7,631.

Editor of "Sun."

Woodbridge, William: U. S. Senator; b. in Norwich, Conn., Aug. 20, 1780. His father was one of the earliest emigrants to the Northwest Territory, removing to Marietta, O., in 1791. The son received his earliest education in Connecticut; studied law at Litchfield, and was admitted to the bar in Ohio in 1806; in 1807 was elected to the Assembly; was prosecuting attorney for his county 1808–14, during

which period he was also a member of the State Senate; in 1814 received from President Madison the appointment of secretary of the Territory of Michigan, and removed to Detroit; in 1819 was elected the first delegate from Michigan to Congress; judge of the Supreme Court of Michigan Territory 1828–32; in 1835 was a member of the convention called to form a State constitution; in 1837 was elected to the State Senate of Michigan; in 1839 was chosen Governor of the State; was Senator in Congress 1841–47. For many years before his death he lived at Detroit. D. Oct. 20, 1861.

Woodbury: town (named in 1674); Litchfield co., Conn.; on the Pomperaug river, and the N. Y., N. H. and Hart. Railroad; 12 miles W. of Waterbury, 25 miles N. W. of New Haven (for location, see map of Connecticut, ref. 9–E). It contains the villages of Woodbury, North Woodbury, Hotchkissville, and Minortown; has a savings-bank, Parker Academy, a weekly newspaper, and manufactures of woolen goods, cutlery, powder-flasks, and shot-pouches. In 1894 it had a grand list of $898,938. Pop. (1880) 2,149; (1890) 1,815; (1900) 1,988. EDITOR OF "REPORTER."

Woodbury: city (chartered in 1871); capital of Gloucester co., N. J.; on the Del. River and the West. Jersey railways; 8 miles S. of Philadelphia (for location, see map of New Jersey, ref. 6–B). It contains 6 churches, 3 public schools, a widely known private school, public library with 5,000 volumes, and 2 national banks with combined capital of $200,000, and has a monthly and 3 weekly periodicals. The city has gas and electric-light plants, water-works, and manufactories of chemicals, glass, and pianos. It is connected with Philadelphia by steam and trolley lines, and is an important shipping-point for fruit, berries, and vegetables. Pop. (1880) 2,298; (1890) 3,911; (1900) 4,087.
EDITOR OF "GLOUCESTER COUNTY DEMOCRAT."

Woodbury, DANIEL PHINEAS: soldier and engineer; b. at New London, N. H., Dec. 16, 1812; graduated at U. S. Military Academy July 1, 1836, appointed second lieutenant of artillery. Soon after transferred to the engineers, he was promoted captain 1853 and major 1861. At the outbreak of the civil war, he was assigned to duty under Gen. John G. Barnard, and became henceforth associated in the arduous duties involved in providing for the defense of the capital and in the engineering organization of the Army of the Potomac. As commander of the brigade of engineers he had immediate control of a large portion of the engineering operations in the siege of Yorktown and subsequent operations before Richmond. In the memorable "Seven Days," and more especially in the engineering works by which the army was able to cross the White Oak Swamp and move to the James river, Gen. Woodbury rendered conspicuous services. At the unfortunate battle of Fredericksburg his personal gallantry in throwing bridges across the Rappahannock won him the brevet of brigadier-general. Detailed for the important command at Key West Mar. 16, 1863, he fell a victim to the yellow fever Aug. 15, 1864.

Woodbury, GEORGE EDWARD: author; b. at Beverly, Mass., May 12, 1855; graduated at Harvard College in 1877; was Professor of English Literature in the Nebraska State University in 1877–78 and 1880–82, and was appointed to a similar position in Columbia College, New York, in 1892. Besides many papers in reviews and magazines, he has written a *History of Wood Engraving* (1883); *Life of Edgar Allan Poe* (1885); and *The North Shore Watch and other Poems* (1890). In 1894 he published an edition of Shelley, and in 1895 an edition of Poe, in collaboration with E. C. Stedman. HENRY A. BEERS.

Woodbury, LEVI: jurist; b. at Francistown, N. H., Dec. 22, 1789; graduated at Dartmouth College with the highest honors of the class in 1809; was admitted to the bar, and began the practice of the law in his native town in 1812. He was an earnest Democrat, and zealously supported the war against Great Britain. In 1816 he was appointed a judge of the Supreme Court of the State; in 1823 was elected Governor; in 1825 was elected Speaker of the House of Representatives of the State, and to the Senate of the U. S.; in May, 1831, was appointed Secretary of the Navy, and in 1834 Secretary of the Treasury, by President Jackson, and remained in the last-named office till the close of President Van Buren's administration in 1841, when he was again elected to the Senate of the U. S. In 1845 he declined the mission to England, and was appointed a justice of the Supreme Court of the U. S., and held that office until his death, which occurred at Portsmouth, N. H., Sept. 4, 1851. At the time of his death he was the candidate for the presidency upon whom all factions of his party had agreed.

Wood-carving: sculpture in wood. Many kinds of wood afford excellent material for sculpture. Some hard and close-grained woods, such as box, holly, mahogany, pear, linden, and those of several Oriental trees, are fit for the most minute and delicate carving, whether in relief or in the round. Except on a small scale it is not necessary to seek for woods having an exceptionally fine grain. It is often found that the grain adds a charm to the work—not merely the lines of the veining, as in the case of ivory, but even the open pores as they are cut across at different angles. Thus of all woods oak has been the most employed since the tenth century for all kinds of sculpture, and there is no wood so fit for it and so beautiful, as is shown in the stalls and confessionals of hundreds of churches throughout Europe; but oak, with all its tenacity, its beautiful grain, and the patina it takes from time and wear is a very open-grained wood. Chestnut is excellent, and is much used for coarser work. Walnut has been much used, especially for carved furniture and the like, and in the south of Europe. Sycamore wood, the use of which for large pieces of sculpture is traditional in Europe from the earliest times, seems to have been but little employed in the Middle Ages. The wood of the ancient acacia of some varieties is recognized as having been employed in important sculptures of the earliest times. It is to be remembered that the beauty of the wood when finished was less thought of because sculpture in wood, like that of stone, was generally covered with painting and often in parts gilded. Wood-carving in monumental tombs, in church fittings, and in elaborate furniture was indeed painted in bright colors down to the seventeenth century.

Wood that is to be used for artistical carving should receive a special treatment fitting it for its purpose and adding to its durability. One expedient much used in ancient times was smoking in wood smoke. This, of course, was not used until the wood was well seasoned. It is a custom, still observed in the few cases where delicate carving is to be done, to glue pieces of paper upon the ends of the piece of wood and covering the end grain; such wood may then be thoroughly dried even in hot rooms, without checking, the drying out of the sap taking place equally along the whole length of the wood and not rapidly at the ends. Most workmen of the best class have secrets for the preparation of wood; but the cost of fine work has become so great in modern times that it is very rare that a cabinet or a similar piece of furniture is undertaken with every precaution for the highest excellence of material and artistic completeness.

The soft wood of the common coniferous trees lends itself well to carving on a large scale, and is particularly good for out-of-door work which is to be painted. These woods might equally well be used even where the surface is not to be painted, as may be seen in the curved and pierced panels of Japanese temples and dwelling-houses. Some of those panels are 3 inches or more thick, and are carved in animal and vegetable forms and with legendary subjects, even involving the suggestion of landscape with mountains and clouds, the carving being carried deep into the wood so that parts of it are pierced through. The domestic architecture of India includes a great deal of effective wood-carving, the pieces being often very large and covered with minute flower and leaf sculpture. In this Indian work carving is used in excess, all parts being equally covered with it. It is frequently painted in rich colors, but apparently rather for ornament than for preservation.

The earliest piece of wood-carving which we know is also perhaps the earliest piece of sculpture known. This is the celebrated Egyptian statue called the Sheikh-el-Beled or "village chief," so named by the natives when first discovered—the life-size statue of a short and stout man, apparently of sycamore wood, and dating from an epoch about 4,000 years B. C. A few other large pieces of Egyptian sculpture in wood are preserved, especially in the Boulak Museum, now removed to Gizeh. Wood-carving of the Greeks is not known, but it is certain that many of the sacred statues, regarded with great veneration throughout classical antiquity, were of wood. The type of the earliest stone statues seems to be that of the primitive wooden ones, and the term *xoanon* has been applied to the lost wooden prototype and the earliest stone copy alike. Classical Roman sculpture in wood has also perished. There is, in fact, little hope of finding well-preserved wooden articles in tombs or

otherwise buried in a climate and soil less dry than those of Egypt. The doors of the Church of St. Sabina at Rome have been thought to date from the fifth or sixth century, but this theory is now abandoned.

It is with the later Middle Ages that the finest wood-carving is associated. The stalls and other fittings of the choir in the Church of Ratzeburg, near Lubeck, those in Notre Dame de la Roche, near Paris, those of the Cathedral of Auch, and especially those of the Cathedral of Amiens, are specimens of the most admirable detailed carving of men and animals, foliage and the like, all combined in a semi-architectural design of great dignity and importance. The stalls were often crowned by high Gothic canopies, with tracery, gables, and pinnacles. The bishop's chair and the reading-desk are parts upon which a great deal of detail was lavished. The carving of the arms of the stalls, the *misericordes* or *misereres* under the seats and frequently of the ends of the benches, is often rich and varied, with incidents and character studies of wonderful vigor and truth of interpretation.

Larger carvings were used for the wooden structural parts of churches and other buildings. Of these almost nothing remains except the English open timber roofs; and the ends of the hammer-beams in Westminster Hall, carved into angels holding shields, are good instances of the kind of work which was put upon such architectural members.

The portable furniture of the same epoch, French, German, Italian, and English, though but few pieces remain, gives us an excellent example of elaborate carving used for the adornment of the simplest and most natural forms. The furniture-makers of the Middle Ages used only very simple methods of putting together the parts of their benches and tables, but decorated the members by skillful cutting away of the wood in picturesque curves where comparative thickness was not needed, and by carving of leafage and animals wherever their forms could be introduced as part of the general design. (See FURNITURE.) Wood-carving was used also for images of the sacred personages of Christian theology, both small and portable, and of large size in connection with the altar, the rood screen, etc.

The mediæval forms of church fittings were retained after the close of the epoch of Gothic architecture. The churches of the Renaissance and of the seventeenth century were fitted up with stalls, thrones, singing-desks, and the like, as elaborate as those of the Middle Ages, but of a different style. In the Church of Sta. Maria in Organo, in Verona, is an elaborate candelabrum, 15 feet high, for the Pascal candle; a reading-desk arranged with a double-revolving support for the service-book, and mounted on a pillar which rests upon a large base serving as a cupboard for the storage of sacred articles; and choir-stalls of great beauty. All these are of walnut, and although much of the decoration is *intarsiatura*, or inlaying of one wood in another (see INLAYING), many parts of the structure are elaborately carved. This is ascribed to Fra Giovanni da Verona, and is certainly of the years from 1480 to 1510. The stalls of Sta. Maria Gloriosa dei Frari at Venice are of the same epoch, though they retain a Gothic feeling in some of their details; those of the Church of S. Zaccaria and of S. Stefano, both in Venice, St. Francis of Assisi, and of the Cathedral of Sienna contain wood-carving of the time of the Renaissance. In like manner the Cathedral of Notre Dame in Paris contains in the choir some beautiful wood-carving of the time of Louis XIV. The churches of Belgium contain high wainscoting and partitions of oak of the sixteenth and seventeenth centuries, decorated with twisted columns with elaborately carved capitals and bases. In connection with these, confessionals, which structures were not treated as separate compositions in the Middle Ages, were made a part of the general design and often the most prominent feature in it. The pulpits in some of the churches in Belgium are of excessive richness, with statues and groups representing biblical scenes, the carving being not confined to the decoration of the surfaces of the structure, but free of it and occupying a large span on the floor. These extraordinary pulpits are of the eighteenth century, and represent a low ebb of taste in spite of their extreme richness and the evident skill of the workmen.

In all the times and places of a free use of wood-carving, the art grows to be familiar and the mechanical process easy and rapid beyond the conception of those who have only seen it done to order in an inartistic and commercial community. Thus in cities of France, where old traditions still partly remain undisturbed, very interesting and spirited carving in oak is done at a price surprisingly low, and yet done by men who are well-to-do citizens earning a good living. Some of these men have also a considerable knowledge of certain styles of art, and can do "Louis XIII." or "Louis XV." work without special study or preparation. In all this work it is noticeable how simply it is done; how few cuts, how few minutes have gone to the shaping of a leaf or a bunch of leaves. At present and especially in the U. S. the demand is generally restricted to very delicate and highly finished work. Moreover, there are fewer competent wood-carvers in a great city like New York than there are in many a French town of one-twentieth its size. RUSSELL STURGIS.

Woodchat: the *Lanius rutilus*, a shrike of the Old World which has a very wide geographical range. In South Africa it is called "magistrate bird," from its habit of impaling and hanging its victims. In some systematic treatises it is named *Enneoctonus rufus*, the "red nine-killer," from the belief that it kills nine victims before it begins to eat.

Woodchuck, or **Ground-hog**: the *Arctomys monax*, a large rodent mammal of North America, quite common in the eastern portions. It is about 18 inches long, and has a grizzled reddish-brown fur, which has a limited industrial use. The creature is very prolific, eats clover, young cabbages, and beans, hibernates in cold weather, and is sometimes used for food. It digs a deep burrow. See SCIURIDÆ. Revised by F. A. LUCAS.

Woodcock: either of two different game-birds of the snipe family. The European woodcock (*Scolopax rusticola*, Linn.) ranges over the Eastern continent from Japan to the British isles, and attains a length of 14 inches, while the American bird (*Philohela minor*, Gray), which attains only 11 inches, is found abundantly in the Northern U. S. and in Canada. The plumage is a warm brown with gray and black markings. The eye is placed high up toward the hinder part of the head. Both are highly prized by epicures for the delicacy of their flesh. The food of the woodcock consists mostly of worms, which it obtains with extraordinary skill, thrusting its beak as far as the nostrils into the soft, moist earth. A tame woodcock has been seen to probe large turfs with its bill, and to draw out a worm at every thrust of the long slender beak. It is thought that the sense of smell enables the bird to discover the worms beneath the surface. It moves about chiefly on misty days, and is said by experienced woodcock-shooters to prefer the northern side of a hill to the southern. It is a very silent bird, seldom uttering a cry except when first starting for its feeding-places, and hardly ever crying when flushed. The flight of the woodcock is wonderfully swift, although the wings do not appear to move very fast. Revised by F. A. LUCAS.

Wood-duck, or **Summer-duck**: the *Aix sponsa*, one of the most beautiful members of the family of *Anatidæ*, whose only congener is the still more beautiful mandarin duck (*Aix galericulata*) of China. Both of these have the bill shorter than the head, high at the base, where the upper lateral angle runs back much behind the lower edge, the nail very large and hooked, the lamellæ broad and distant, the nostrils very large and open, the wing-coverts nearly as long as the feathers, and the tail truncate at the tip. The wood-duck has the head green, glossed with purple, with a line from the upper corner of the bill, one from behind the eye, and two bars on the side of the head confluent with the chin, and upper part of throat white, the jugulum and tail at sides purple, the under parts white, the sides yellowish, banded with black, and subterminally with white, the speculum bluish green, the primaries silver white at tip, and the back uniform with various reflections. It is about 19 or 20 inches long. (*Baird.*) The species ranges over most of North America—in the warmer regions as a permanent resident, and in the northern as a summer migrant. It builds its nest generally in a hollow tree. Its eggs are smaller than a hen's, and have surfaces like polished ivory. It is generally seen in pairs, and rarely in flocks of more than three or four. It feeds chiefly on acorns, the seeds of wild oats, and insects. The flesh is tolerably good food.

Wood-engraving: the art of carving a smooth flat surface of wood in very low relief, so that a figure or pattern is left raised above the background no more than is sufficient to enable the whole to be used as a stamp or type for printing in ink upon paper. All other processes which might be called wood-engraving have disappeared, if they ever existed, and the use of the term is limited as above.

In the modern practice of Europe and America the wood is always boxwood, and it is cut across the grain, so that the engraver has end-grain to work upon; but in Europe before the seventh century, and in China and Japan, the wood is used in planks cut in the usual way. A drawing being made upon the surface of the wood, or transferred to that surface by photographic process, as in recent times, the engraver cuts away the parts left white and leaves the darks. If, now, the engraver is asked to follow exactly lines that are drawn for him, no discretion being left to him, he requires mere technical skill and neatness of hand. This seems to have been the case in the famous wood-engravings of the sixteenth century, those by Albert Dürer and others, mentioned below, and also generally in China and in Japan. When, however, the drawing has been made partly in tints, as in washes of India-ink and touches of white, the engraver has not a black line to leave standing while he cuts away around it, but a certain artistic effect to reproduce. Thus as the drawing offers him a surface of gray, darker in one part than in another, it is his duty to produce a similar effect by certain black lines or spots printed on white paper. He is compelled then to cut out such parts as in his judgment will leave the surface of the block such that ink printed from it on paper will produce the tint or the gradation needed. This is, of course, true artistic work. The artist is indeed a copyist or reproducer, but his duty is to copy in one art, viz., engraving, an effect produced by a very different art, viz., drawing with a lead pencil and camel's-hair brush. Such wood-engraving as this is recognized as a very admirable fine art, and prints taken from the blocks engraved in this way are valuable works of art, and are loved and bought at high prices and carefully preserved.

One important distinction is to be observed: the easiest and simplest way for a wood-engraver to work is to cut narrow grooves and little pits in the surface, which grooves and pits will come out white on a black ground when the impression is taken in ink on paper; the most difficult and the slowest way is to leave lines and points standing while he cuts away from around them. The latter must be the process used by the mere mechanical workman who follows the lines set down for him, because this is the only way of reproducing those lines on the paper; but the artist working freely will choose the former. A wood-engraver of ability, working as he pleases, will then consider his wooden surface as a solid black space, out of which he is to get his work of art, made up of different grays and blacks and whites. He will work then *in the white line*, as it is called, very much as a student would draw in white chalk on a blackboard, making a careful drawing of a statue or bas-relief, putting in the lights, and leaving the black or gray ground for the darks. This is the peculiarity of the work of Thomas Bewick, W. J. Linton, Timothy Cole, Gustav Kruell, and the other able men belonging to the school of which those artists are chiefs.

The Art in China and Japan.—It is generally thought that the Chinese were the first to use wooden blocks with figures in relief for printing. The device is so obvious, however, that any one who might wish for a stamp to use instead of a signature would be apt to employ it. It seems probable that the first artistic use of it was Oriental, and Oriental scholars generally assume that such artistic work was done in China as early as the eighth or ninth century of our era. It spread at a very early date to Japan and Corea and perhaps to other Eastern nations. Fine and artistic prints evidently made from wood blocks are known, the dates of which are fixed with some certainty as early as the fourteenth century A. D., but books printed from engraved blocks of wood are known to be much earlier. These block books of Chinese make, the syllabic characters of which are engraved with great care and delicacy, date from the tenth century A. D.; but these contain no illustrations. Japanese and Chinese wood-engraving of later dates is known to us by many excellent examples. Much of it is in outline, and the prints have been taken in black ink on white or nearly white paper, so that they appear like early European prints from wood blocks to have been intended for coloring by hand. The Japanese at an early date discovered a remarkable means to artistic effect in the free use of rather large patches of solid black. These black patches were, however, not the monotonous glossy silhouettes that they would be in European art. The peculiar paper used for the impressions and perhaps something in the grain of the wood caused the black surface to be filled with minute striations, and gave it great diversity. What is called local color in black and white drawing or printing—that is, the representation of the strength of natural colors by darker and lighter modifications of black and white—is treated with great freedom in these woodcuts. Thus in a picture where the murder of the hero by spears is the chief subject, his blood in large patches is given in solid black, whereas in other prints of the same period black is kept for ceremonial caps and the glossy hair of the personages, the lower parts of the horses' legs, their manes and tails—in other words, for those parts which might easily be really black or very dark in nature. It is in color-printing, however, that the most extraordinary results have been reached in the Chinese and Japanese use of this art. It is late in its development, seeming not to have been in use before 1700 A. D., and is evidently imitated from the hand coloring of outline prints. The color is laid upon the block with great care and skill by hand, the gradations and breaking of the color being done upon the block and printed off at once upon the paper. Such prints resemble water-color drawings. They are of extraordinary merit, both expressional and decorative, and such prints when fine have been in eager demand in Europe and the U. S., though scarcely known to the West before 1875, the finest examples much more recently.

In Europe.—Wood-engraving in the West begins in the fifteenth century. Cuts dated 1423 and 1418 have been thought the earliest artistic work, but a still earlier date has probably been established by Henri de Laborde. It is generally held that the first European wood-engraving was in BLOCK BOOKS (*q. v.*), which would have preceded the purely artistic compositions made for separate printing; but Léon de Laborde has given excellent reasons for his belief that the earliest relief engraving for artistic purposes was done upon metal. It is certain, however, that block books exist which are as early as the beginning of the fifteenth century. Rude illustrations appear in these at a very early date, and the next step to be taken would seem to be obvious and inevitable. Before the close of the fifteenth century woodcuts had been engraved in Italy, the prints from which exist in abundance and are of great beauty. They are generally in pure outline and of small size. They illustrate such books as early editions of Dante, the *Letters of St. Jerome* (1497), Ovid's *Metamorphoses* (1497), a translation of Vegetius's *Art of War* (1496), and the celebrated *Hypnerotomachia* of Francisco Colonna (1499). By the middle of the sixteenth century wood-engravings of an elaborate kind were being produced in Germany and France as well as in Italy. Some of these are very large. The engravings in Albert Dürer's *Apocalypse*, which were published early in the sixteenth century, those of the *Life of the Virgin*, and those of the *Greater Passion*, as it is called, are all large, the prints of the last-named series about 11 by 15 inches. Prints as large appear in books of this period. Artists such as Lucas Cranach, Hans Schaufelin, and Hans Burgkmaier made the drawings for them, and it is often claimed for them, but probably without sufficient reason, that these artists engraved the blocks themselves.

The large prints from wood-engravings published in the sixteenth century were commonly, but not always, parts of books. Sometimes the title-page of a book not otherwise illustrated would be adorned with a rich border and ornamental lettering and coats-of-arms. Sometimes a frontispiece would be inserted opposite the title-page. The *printer's mark*—that is, the device or emblem of the printer and publisher—was often a decorative composition or a figure-subject with an ornamental border and a motto, and this print would come upon the title-page or at the close of the volume or elsewhere. Often, however, the book would be full of illustrations either of the full size of the page or inserted in the text. Thus the *Schatzbehälter*, a book of devotion printed in Nuremberg in 1491 and containing ninety-five large pictures of Bible history, each about 7 by 10 inches actual size of print, was followed by a number of such books which succeeded each other all through the sixteenth century. In like manner the celebrated Vergil translated into German rhyming verse and published at Strassburg in 1502 has some pictures the full size of the page and others in the text, which among them tell the whole story of the *Æneid* pictorially, and similar fantastic illustrations of ancient story and of history as understood in the Middle Ages were used in many books published throughout the century. These pictures were clearly intended for painting by hand. Many volumes remain to us in which all or a part of the

illustrations have been so painted, this having been done at the time or very soon after. Sometimes they have been colored very skillfully and with great elaboration, like original paintings, and touched with gold, the black outline wholly disappearing. Of all this early and facsimile engraving the most refined and delicate is perhaps that done by Hans Lützelburger, of Basel, who engraved Holbein's drawings of the *Dance of Death*, published in 1538 and frequently thereafter.

In the sixteenth and seventeenth centuries color was used in a very guarded way by the printers of woodcuts in Italy and elsewhere. Two blocks or more were used, each block for a different shade. The resulting prints were called *chiaroscuro prints*, and these form a special branch of the art and study of wood-engraving. Some of these were very large. Thus John Baptist Jackson, an Englishman, published in 1742 a print after Titian's *Presentation of the Virgin in the Temple*, which print on three sheets of paper is exactly 4 feet long, one of the great *Marriage of Cana* by Paul Veronese, which is made up of two parts each 17 by 23 inches, and many others; these being in three tints of brown or gray, the white paper showing through freely, and the colors being mingled with each other and with the white by the usual hatchings and dottings.

THOMAS BEWICK (*q. v.*) is the first engraver who made the engraving itself a fine art, as explained above. He used the white line with freedom and with great intelligence. The first collection of his prints is in the *Select Fables*, published 1784, but those contained in the *General History of Quadrupeds* (1790) are more important and have never been excelled in their peculiar merits. The engravers of the nineteenth century have not generally used the white line freely. Luke Clenell, a pupil of Bewick, is the chief of those in the early part of the century. Other able engravers, such as William Harvey, Robert Branston, and John Thompson, though admirable artists in their way, scarcely ever used the freer and more artistic process. Of engravers of the latter half of the nineteenth century Stephane Pannemaker, a Belgian, has done wonderful work. Edward Evans is an English artist with great delicacy of touch, but generally producing rather mechanical drawings in a mechanical way. William J. Linton is probably the greatest wood-engraver since Bewick's death, at once artist and technician. Henry Marsh, in his illustrations to Harris's *Insects Injurious to Vegetation* (Boston, 1862), has produced artistic and individual engraving worthy of Bewick. Of the engravers who have done such admirable work for *The Century* and *Harper's Magazine*, Cole and Kruell have been named above. William Kingsley should also be mentioned.

See W. J. Linton, *Wood Engraving: a Manual of Instruction* (London, 1884); John Jackson, *A Treatise on Wood Engraving, Historical and Practical* (London, 1837; also an enlarged edition 1861); Henri de Laborde, *La Gravure, Précis Élémentaire* (Paris, 1882); Alfred de Lostalot, *Les Procédés de la Gravure* (Paris); Firmin Didot, *Essai Typographique et Bibliographique sur l'Histoire de la Gravure sur Bois* (Paris, 1863). RUSSELL STURGIS.

Woodfall, HENRY SAMPSON: editor; b. in London, England, 1739; was son of the proprietor of the London *Public Advertiser*, and succeeded to the management of that paper, which he edited from 1760 to 1793, including the period during which the celebrated *Letters of Junius* (see JUNIUS, LETTERS OF) appeared in that paper (1769–71); was prosecuted and tried for their publication June, 1770; printed the standard edition of *Junius* in 1772, and became master of Stationers' Hall 1797. D. at Chelsea, Dec. 12, 1805. He probably never knew the secret of Junius, though an argument to the contrary has been alleged by the advocates of the Francisean theory from the fact that he was a schoolfellow of Philip Francis.—His son GEORGE, b. about 1780, succeeded to the business; brought out a famous edition of the Bible (4to, 1804) in which only one erratum has been detected, and employed Dr. John Mason Good to edit the *Letters of Junius* (3 vols., 1812), whence that edition is usually called *Woodfall's Junius*, and is supposed to derive peculiar authority from the name of its publisher. In fact, however, the only real *Woodfall's Junius* is the edition of 1772, and Good's edition of 1812 is the most misleading of all from the fact that it includes a multitude of anonymous letters under different signatures culled from the columns of the *Public Advertiser* by Dr. Good, and attributed by him to Junius without any warrant.

Woodford, STEWART LYNDON, LL. D.: lawyer and soldier; b. in New York city, Sept. 3, 1835; graduated at Columbia College in 1854, and began the practice of law in his native city in 1857. He was assistant U. S. attorney at New York from Apr., 1861, to Aug., 1862, when he resigned and served three years in the U. S. army. He was appointed chief of staff to Maj.-Gen. Gilmore, commanding the department of the South; served in the Army of the Potomac; was military commandant of Charleston, S. C., was military governor of Savannah, Ga., and was breveted brigadier-general for service in the field and assigned to duty as of brevet rank. He was elected Lieutenant-Governor of New York in 1866, and in 1870 was the Republican candidate for Governor, but was defeated by John T. Hoffman. In 1872 he was sent to Congress from the third district of Brooklyn, but resigned in 1873, and in 1875 canvassed Ohio in joint debate with Thomas Ewing in behalf of a sound metallic currency. From Jan., 1877, to Mar., 1883, he was U. S. attorney for New York. He was a trustee of Adelphi Academy, Brooklyn, and of Cornell University. He has published several college and commencement literary addresses, and sundry pamphlets on legal, literary, and political subjects. He was appointed minister to Spain in July, 1897, and served in that capacity until war was declared in April, 1898.

Wood Grouse: See CAPERCAILZIE.

Woodhouselee: See TYTLER, ALEXANDER FRASER.

Wood Ibis: See IBIS.

Woodland: city; capital of Yolo co., Cal.; on the South Pac. Co.'s railway; 20 miles N. of Sacramento, 86 miles N. E. of San Francisco (for location, see map of California, ref. 6–C). It contains a public high school, Academy of the Holy Rosary, and Hesperian College (Christian, organized in 1861), and has 4 State banks with combined capital of $1,468,600, 2 daily and 3 weekly newspapers, and large interests in wheat, barley, and fruit-growing, wine-making, wool-growing, and stock-raising. Pop. (1880) 2,257; (1890) 3,069; (1900) 2,886.

Wood-louse: any one of various isopod crustaceans, of the genera *Porcellio*, *Oniscus*, *Armadillo*, etc. They are otherwise called slaters, sow-bugs and pill-bugs. They inhabit moist places, rotten wood, cellars, etc., and are often found under stones.

Wood-naphtha: See METHYL ALCOHOL.

Wood-oil: a fine aromatic drying oil used in making varnish, in preventing insect ravages, in making lithographic ink, and in medicine as a cure for gonorrhœa. It comes from Burma, and is produced by the *Dipterocarpus turbinatus* and other trees.

Woodpecker: a popular name for the birds of the family *Picidæ*, or, more strictly, of the sub-family *Picinæ*, given on account of their habit of cutting, or pecking, into trees either in search of food or to build their nests. They have the outer (fourth) toe turned backward, bill compressed at the point to form a chisel, tail-feathers more or less stiff, strong, and pointed, except in the little birds of the genus *Picumnus* (chiefly South American), where they are soft and rounded. The claws are strong, scales of the feet well developed, both features connected with their climbing habits. The salivary glands are large, and the tongue usually very long, extensile, and barbed at the tip. Aside from these, the woodpeckers are mostly of moderate size, ranging from the great Mexican *Campophilus imperialis*, which is 22 inches long, to the little downy *Picus pubescens* of 6 inches. Though not, as a rule, bright-colored birds, many species have a plumage which is striking from its sharp contrasts of black and white, heightened by the red, crescent-shaped nape-mark. Some species have conspicuous crests, and others, like the flickers of North America *Colaptes auratus* and *C. cafer*, have considerable red or yellow about them; but this is so blended as not to be glaring. Woodpeckers live largely on ants, grubs, and other insects, as well as on fruit and vegetable food. The tongues of the majority of species form effective spears for impaling wood-boring grubs, whose burrows are cut into by the strong bill. In other species, like the flicker, the tongue is used for probing ant-hills, or picking these insects from the ground, being plentifully besmeared with sticky saliva. The sapsuckers, *Sphyrapicus*, have comparatively short and brushy tongues. (See SAPSUCKER.) The California woodpecker, *Melanerpes formicivorus*, stores up acorns in holes cut into dead branches, and scores may be seen imbedded in one limb. A woodpecker's eggs are six to nine in number, white, glossy, and translucent.

There are between 250 and 300 species of woodpeckers, distributed over the greater portion of the globe, save Madagascar and the Australian region, except Celebes and Flores. About half this number are American, and twenty-two species and thirteen sub-species occur in the U. S. One of these, the ivory-billed woodpecker, *Campophilus principalis*, is in some danger of being exterminated, being limited to the wilder parts of Florida in the East, although still found sparingly in some parts of the Southwest. F. A. LUCAS.

Wood-rat: See RAT.

Woodrow, JAMES, Ph. D., M. D., D. D., LL. D.: educator; b. at Carlisle, England, May 30, 1828; was educated at Jefferson College, Canonsburg, Pa., Lawrence Scientific School, and Heidelberg; Professor of Natural Science in Oglethorpe University, Ga., 1853–61, where he privately pursued a full theological course, and was ordained into the Presbyterian Church South in 1860; Perkins Professor of Natural Science in connection with Revelation in the Presbyterian Theological Seminary, Columbia, S. C., 1861–84, when he was removed for views expressed in a public address on *Evolution*; reinstated in 1885, and ceased to act in 1886; Professor of Science in South Carolina College 1869–72; in South Carolina University 1880–91; and since 1891 president of South Carolina College. Dr. Woodrow has been editor of *The Southern Presbyterian Review* 1861–85, of *The Southern Presbyterian* since 1865; and has published many review articles, such as *Geology and its Assailants* (1862); *An Examination of Certain Recent Assaults on Physical Science* (1873); and *A Further Examination* (1874). C. K. HOYT.

Woodruff: the *Asperula odorata*, a favorite herb of the European peasants, belonging to the family *Rubiaceæ*. It has, when dry, a pleasant odor, somewhat like that of the Tonquin bean or sweet clover. The Germans put it into their May-drink (*Maitrank*) and into home-made beer. In America *Galium triflorum*, a related plant with a similar smell, is used as a substitute.

Wood-rush: See LUZULA.

Woods, LEONARD, D. D.: professor of theology; b. at Princeton, Mass., June 19, 1774; graduated at Harvard 1796; studied theology; was ordained pastor of the Congregational church at West Newbury 1798; took an active part in the Unitarian controversy, vindicating "orthodox Calvinism" against Drs. Ware, Buckminster, and Channing; was prominent in the organization and management of tract, education, temperance, and foreign missions societies; was Professor of Theology in Andover Seminary from its establishment in 1807 until 1846, and emeritus professor from that time until his death Aug. 24, 1854. Among his works were *Letters to Unitarians* (Andover, 1820); *Reply to Dr. Ware's Letters to Trinitarians* (1821); *Lectures on the Inspiration of the Scriptures* (1829); *Letters to Rev. N. W. Taylor* (1830); *Memoirs of American Missionaries* (1833); *An Examination of the Doctrine of Perfection, etc.* (1841); *Reply to Mr. Mahan on the Doctrine of Perfection* (1841); and *Lectures on Swedenborgianism* (1846). A collective edition of his *Works* appeared at Andover (5 vols., 1849–50; 4th ed. 1860). Revised by G. P. FISHER.

Woods, WILLIAM BURNHAM: soldier and jurist; b. at Newark, O., Aug. 3, 1824; educated at Western Reserve College and at Yale, where he graduated 1845; was admitted to the Ohio bar in 1847; was elected mayor of Newark, O., in 1856 and 1857; served two terms in the Ohio House of Representatives as a Democrat, and became Speaker of the body; in Sept., 1861, was commissioned lieutenant-colonel of Seventy-sixth Ohio Infantry; was engaged in many battles during the civil war, and became brigadier-general and brevet major-general; removed to Alabama after the war, and became a chancellor of that State in 1867, and U. S. circuit judge in 1869; in 1877 removed to Atlanta, Ga., and on Dec. 21, 1880, was commissioned associate justice of U. S. Supreme Court. D. at Washington, D. C., May 14, 1887.

Wood's Halfpence: copper currency coined in Ireland by William Wood in accordance with a grant made in 1722, giving him a share of the profits from the difference between the nominal and bullion value of the coins. A portion of these profits also went to the king's mistress, the Duchess of Kendal. Swift attacked the system in his famous *Drapier's Letters*, with the effect of stirring the public indignation and causing the cancelation of the patent.

Woods Holl (formerly *Wood's Hole*): village; Falmouth town, Barnstable co., Mass.; on Buzzard's Bay, Vineyard Sound, and at the terminus of the Woods Holl Branch of the Old Colony Division of the N. Y., N. H. and Hart. Railroad; 7 miles N. W. of Cottage City, on Martha's Vineyard, and 72 miles S. E. of Boston (for location, see map of Massachusetts, ref. 5–J). It has long been noted as a harbor of refuge for shipping, and contains one of the most important stations of the U. S. fish commission for the propagation of cod, scup, sea-bass, lobsters, and other food-fishes. The lower floor of the main building contains fish-hatching jars and tanks, while the upper floors are devoted to the scientific study of all problems connected with the fisheries. Opposite the main building is a thoroughly equipped marine biological laboratory, supplied with tanks of running sea-water, and having a technical library and a lecture-room. In 1895 there were fifteen instructors and 188 students and investigators at the station. The U. S. Government owns a plot of land with a shore-line of over one-third of a mile. Pop. of village (1880) 508. Not returned separately in 1900.

Wood-sorrel: See OXALIS.

Wood-spirit, or **Wood-naphtha**: See METHYL ALCOHOL.

Woodstock: port of entry; capital of Carleton County, New Brunswick; on Canadian Pacific Railway; on the river St. John, which is navigable at high and medium stages of water (see map of Quebec, ref. 5–G). It is 12 miles E. of Houlton, Me., and is in a fertile region. Red hæmatite iron ore, charged with manganese, and making a prized variety of steel, was formerly mined here, but the mine is abandoned. Pop. 3,000.

Woodstock: port of entry and railway center; capital of Oxford County, Ontario, Canada; 28 miles E. N. E. of London, and on the river Thames and Cedar creek, which affords water-power (see map of Ontario, ref. 5–C). It is well built, and situated in a healthful and fertile region. It has a large trade in wheat and flour. Pop. (1891) 8,610.

Woodstock: town (incorporated as a part of Massachusetts in 1690, annexed to Connecticut in 1749); Windham co., Conn.; 5 miles N. W. of Putnam, 41 miles N. E. of Hartford (for location, see map of Connecticut, ref. 7–K). It contains the villages of Woodstock, North Woodstock, South Woodstock, East Woodstock, West Woodstock, and Woodstock Valley; has an academy and a public library; and is principally engaged in agriculture and the manufacture of cotton twine. Pop. (1890) 2,309; (1900) 2,095.

Woodstock: city; capital of McHenry co., Ill.; on the Chi. and N. W. Railway; 32 miles E. of Rockford, 51 miles N. of Chicago (for location, see map of Illinois, ref. 1–F). It is in an agricultural and dairying region; contains 6 churches, city-hall that cost $30,000, water-works plant that cost $21,000, the Todd Seminary for boys, public library, pickling and canning works, several mills, a State bank with capital of $25,000, and a private bank; and has 3 weekly newspapers. Pop. (1880) 1,475; (1890) 1,683; (1900) 2,502. EDITOR OF "SENTINEL."

Woodstock: town; capital of Windsor co., Vt.; on the Ottaquechee river, and the Woodstock Railway; 40 miles S. of Montpelier (for location, see map of Vermont, ref. 7–C). It is in an agricultural region; contains the villages of Woodstock, South Woodstock, West Woodstock, and Taftsville; and has 6 churches, high school, the Norman Williams Public Library (founded in 1885), a national bank with capital of $300,000, a savings-bank, 3 hotels, 2 weekly newspapers, and manufactories of butter and cheese, carriages and sleighs, lumber, soap, hay-rakes, and doors, sash, and blinds. Pop. (1880) 2,815; (1890) 2,545; (1900) 2,557; Woodstock village (1880) 1,266; (1890) 1,218; (1900) 1,284. EDITOR OF "VERMONT STANDARD."

Woodstock: town (laid out in 1762); capital of Shenandoah co., Va.; on the north branch of the Shenandoah river, and on the Balt. and Ohio Railroad; 100 miles W. of Washington, D. C., 160 miles N. W. of Richmond (for location, see map of Virginia, ref. 4–G). It is in an agricultural and stock-raising region, and has eight churches, separate public schools for white and colored children, several private schools, a number of manufactories, a State bank with capital of $41,500, and a weekly newspaper. Pop. (1880) 1,000; (1890) 1,068; (1900) 1,069. EDITOR OF "SHENANDOAH HERALD."

Woodstown: borough; Salem co., N. J.; 10 miles N. E. of Salem, 25 miles S. of Philadelphia (for location, see map of New Jersey, ref. 6–B). It is in an agricultural and marl region, and has a public library (founded in 1858), a

Friends' academy, a national bank with capital of $75,000, extensive canneries, manufactories of shirts and agricultural implements, and a weekly paper. Pop. (1880) 490; (1890) 1,516; (1900) 1,371. EDITOR OF "MONITOR-REGISTER."

Wood-swallows, or **Swift Shrikes**: a group of birds slighly resembling swallows in habits and appearance, but belonging to the sub-family *Artamidæ*. In the East Indies and Australia they abound. The *Artamus sordidus*, an Australian species, has the habit of forming clusters like those formed by honey-bees on their hives, the whole flock clinging together, and sometimes forming a mass as large as a bushel basket. They eat insects and seeds, and are somewhat migratory in their habits, arriving in and leaving Van Diemen's Land at regular intervals, and making a partial migration on the Australian continent. Some individuals, however, remain in the same country throughout the year, as they find abundance of food without repairing to another climate. Revised by F. A. LUCAS.

Wood-thrush: See THRUSH.

Woodward, BERNARD BOLINGBROKE, F. S. A.: archæologist and historian; son of Samuel Woodward (1789–1838), author; b. at Norwich, England, May 2, 1816; studied theology in the Independent College at Highbury, near London; took his degree of B. A. at London University 1841; was settled in 1843 as minister of a Congregational church at Wortwell, Norfolk; assisted the printer John Childs in some of his large undertakings, especially in preparing a new edition of James Barclay's *Universal English Dictionary* (1848); settled in London as a professional man of letters 1849; wrote a *History of Wales* (2 vols., 1850–52); completed a *History of the United States of North America to the End of the Administration of President Polk* (3 vols., 1855), which had been begun by William Henry Bartlett; was coeditor (with John Morris and W. Hughes) of Maunder's *Treasury of Knowledge* (1859); wrote several admirable works for the young, including *First Lessons on the English Reformation* (1857); was appointed librarian in ordinary to Queen Victoria and keeper of the prints and drawings at Windsor Castle 1860; edited a *History of Hampshire* (1859–62); founded the *Fine Arts Quarterly Review* (1863); translated Elisée Reclus's *The Earth* and *The Ocean, Atmosphere, and Life*; and was actively engaged upon his chief work, *The Encyclopædia of Chronology* (completed by W. L. R. Cates, 1872), when he died at London, Oct. 12, 1869. Revised by HENRY A. BEERS.

Woodward, JOSEPH JANVIER, M. D.: surgeon; b. in Philadelphia, Oct. 30, 1833; was educated in the Central High School of that city; studied medicine in the University of Pennsylvania, and graduated in 1853. He practiced medicine in Philadelphia until 1861, when he was appointed assistant surgeon in the regular army, and in 1876 he was made surgeon of the army with rank of colonel. He early attracted attention by his treatises on the use of the microscope in the practice of medicine, and subsequently he was regarded as one of the leading authorities on medical microscopy. He invented an instrument by which myopia or other conditions of the eye can be determined with mathematical accuracy. Among his published works were *Remarks on Croup and Diphtheria*; *Typho-Malarial Fever*; *Photographic Micrometry*; *Application of Photography to Micrometry, with Special Reference to the Micrometry of the Blood in Criminal Cases*; *Outlines of the Chief Camp Diseases of the United States Armies* (Philadelphia, 1863); and *The Medical and Surgical History of the War of the Rebellion* (2 vols., Washington, 1870–79). D. in Philadelphia, Aug. 18, 1884. Revised by S. T. ARMSTRONG.

Woodward, ROBERT SIMPSON, Ph. D.: physicist and mathematician; b. at Rochester, Mich., July 21, 1849; educated at University of Michigan; assistant engineer U. S. lake survey 1872–82; astronomer U. S. transit of Venus commission 1882–84; astronomer U. S. Geological Survey 1884–90; assistant U. S. Coast and Geodetic Survey 1890–93; Professor of Mechanics, Columbia College, New York, from 1893; chairman of section of astronomy and mathematics of the American Association for the Advancement of Science 1889. Prof. Woodward's chief contributions to science have been in the field of precise mensuration, geodesy, the physics of the earth, physical astronomy, and pure mathematics. Among his published papers are *Results of Experiments to Determine the Variation in Lengths of Certain Bars at the Temperature of Melting Ice* (*Am. Jour. Science*, 1883); *On the Free Cooling of a Homogeneous Sphere* (*Ann. Mathematics*, 1887); *On the Conditioned Cooling and Cubical Contraction of a Homogeneous Sphere* (*Ann. Mathematics*, 1887); *On the Form and Position of the Sea Level* (Bull. U. S. Geol. Survey, No. 48, 1888); *On the Diffusion of Heat in Homogeneous Rectangular Masses, with special reference to Bars used as Standards of Length* (*Ann. Mathematics*, 1888); *The Mathematical Theories of the Earth* (*Am. Jour. Science* and elsewhere, 1889); *The Iced Bar and Taped Base Apparatus, and Results of Measures made with them on the Holton and St. Albans Bases* (Rept. U. S. Coast and Geodetic Survey for 1892); *Mechanical Interpretation of the Variations of Latitudes* (*Astron. Jour.*, 1895). G. K. G.

Woodwaxen, or **Woadwaxen**: See DYERS' BROOM.

Woodworth, SAMUEL: poet; b. at Scituate, Mass., Jan. 13, 1785; served an apprenticeship as a printer in the office of Russell's *Columbian Centinel*; edited and printed a short-lived weekly paper at New Haven, Conn., 1807; settled in New York 1809; conducted during the war of 1812–15 a weekly paper, *The War*, and a monthly Swedenborgian magazine, *The Halcyon Luminary*, both unsuccessful; wrote a romantic history of the war entitled *The Champions of Freedom* (2 vols., 1816); published a small volume of poems 1818, and another 1826; was one of the founders of the *New York Mirror* 1823–24; edited the *Parthenon* 1827, and wrote a number of dramatic pieces. D. in New York, Dec 9, 1842. His *Poetical Works* appeared in 2 vols. (1861), with a *Memoir* by George P. Morris. He is chiefly remembered by his song, *The Old Oaken Bucket*.

Woody Nightshade: See BITTER-SWEET.

Wool, JOHN ELLIS: soldier; b. at Newburg, N. Y., Feb. 20, 1784; after engaging in the book business for a time in Troy, the destruction of his stock by fire led to his turning his attention to the study of law, which he abandoned in Apr., 1812, to accept a commission in the army as captain of the Thirteenth Infantry. He distinguished himself in the war of 1812, and in 1816 was appointed inspector-general with the rank of colonel, which position he retained until June 25, 1841, when appointed a brigadier-general, to which rank he had been breveted in 1826. In the war with Mexico he superintended the organization of Western volunteers, and after dispatching some 12,000 to the seat of war, conducted himself a force of 3,000 on the march from San Antonio to Saltillo, a distance of 900 miles, where he joined the army of Gen. Taylor as second in command. At Buena Vista, before the arrival of Taylor, he was in command during the early part of the day, and had made the disposition of the troops for the battle, which was approved of by Taylor on his arrival. After Taylor's return to the States, Wool remained in command of the army of occupation until the close of the war. For his services at Buena Vista he was breveted major-general Feb. 23, 1847, and in 1854 Congress passed a joint resolution of thanks and presented him with a sword for his Mexican services. The State of New York also presented him with a sword. Returning East in July, 1848, he commanded the eastern military division until 1853, the department of the East 1853–54, that of the Pacific 1854–57, when again in command of the Eastern department until 1860. In Aug., 1861, he was placed in command at Fort Monroe, Va., and in May, 1862, occupied Norfolk and Portsmouth. He was promoted to be major-general May 16, 1862; was in June placed in command of the middle military department, including the Eighth Army-corps; transferred to New York Jan., 1863, he commanded the department of the East until July 15, when relieved, and Aug. 1, 1863, was placed on the retired list. D. at Troy, N. Y., Nov. 10, 1869.

Wool and Woolen Manufactures [*wool* is O. Eng. *wull*: Ger. *wulle*: Goth. *wulla*; cf. Lat. *lāna*, Gr. λῆνος, Lith. *vílna*, O. Bulg. *vlŭna*]: strictly, the covering or fleece of the sheep, and the processes by which it is converted into textile and other fabrics. The term wool, however, has been extended to include the hair of the angora, cashmere, and other goats, the hairy fleece of the alpaca, vicuna, and other species of the llama, the soft down from the belly of the camel, several kinds of fur which are spun and woven, and even cow's hair, which is made up into a cheap quality of woolen goods. Wool proper may be distinguished from all these varieties of hair, as well as from all vegetable fibers, by the corrugated character of its fibers and by its property of felting, which is due to the epithelial scales which overlap each other along the course of its fibers, and which, under certain conditions, from their corrugation, interlock with

each other and form a felted fabric. (See FELT.) The average number of these epithelial scales or serrations per linear inch varies greatly in different breeds of wool. The larger numbers improve the elasticity and the felting property in like proportion. East India wool has 1,000 scales per inch; common domestic, 1,400; Leicester, 1,400; merino, 2,000; Saxony, 2,200. The average size of the fiber varies, and almost inversely to the above proportion. East India measures $\frac{1}{700}$th of an inch; common domestic, $\frac{1}{1100}$th; merino, $\frac{1}{1800}$th; Saxony, $\frac{1}{2000}$th. Hair possesses very little of this felting property, but by long beating and rubbing develops it to some extent. The primitive sheep was covered with long hair, the rudiments of the present fleece being an undercovering or down. This hair was bred out, and the wool was left. If sheep are neglected now, or become very old, they will revert to this habit by growing hairs among their wool. Sheep formed a large part of the wealth of the Oriental nations, particularly of those which were more or less nomadic in their habits; and as these were kept very largely for food, though shorn every year, it is remarkable that in the absence of any special efforts to improve the character of their wool it should have retained its good qualities to such an extent as to enable those nations with their rude processes to have produced fabrics of such delicate and exquisitely fine texture as issued from their looms.

The first attempts to improve the breeds of sheep with special reference to the production of a finer quality of wool were made by the Romans about the second century B. C. Their Tarrentine sheep produced a long and finely stapled wool, and their fleeces were very heavy, but the color was either brown or black, and the sheep was so delicate in constitution that they were reared with difficulty, and were kept covered even in the mild climate of Italy. Columella relates in his *De re rustica* that his uncle, Marcus Columella, who was a wealthy agriculturist in Spain, transported some white African rams of great size and beauty to his estate in Bætica, and by continually crossing them with his Tarrentine ewes and their progeny succeeded in producing a breed of white fine-wooled sheep of vigorous and hardy constitution and yielding a heavy fleece. This cross is supposed by many to have been the original of the Spanish merino sheep, which, with its various modifications and crossings, has been the parent of most of the fine-wooled sheep of Europe and America. It was renewed by Pedro IV. of Castile in the middle of the fourteenth century, and probably from Africa, and again with Barbary rams in the sixteenth century by Cardinal Ximenez. Its transportation to France and careful improvement there have led to the production of the French merino, one of the finest of the long-wool breeds. Its introduction into Germany, and modification by crossing and by climatic influences, have produced the fine Saxon wools, adapted to the making of the best broadcloths; and the French sheep of Naz, which yields a more silky wool of great luster, though now a distinct breed, bears traces of its early merino origin. In the U. S. the Spanish merino, introduced by Delessert, Livingston, Col. Humphreys, and William Jarvis between 1801 and 1812, has exerted a wide influence, and, together with the Saxony sheep, the sheep of Naz, and the French merino, constitutes to this day the largest proportion of those flocks which are bred mainly for their wool. The Australian and Cape Colony wools are also largely indebted to the merino sheep for their good qualities. The greatly increased demand for mutton has led to the breeding of sheep which have larger food-producing value, and with which the wool is an incidental rather than the principal product. The Leicester, Cotswold, South Down, Hampshire Down, and Oxford Down among the English sheep are the best of this class, while the undistinguished breeds of South America have some of the same characteristics. The large flocks of the Western States and the Pacific coast are American merinos. These all yield a portion of medium and coarse wools, and while the best grades are valuable for the worsted manufacture, the coarser are equally in demand for carpets, friezes, and the lower grades of goods for men's wear.

Wool is divided primarily into pulled and clipped or fleece wools, the former being pulled by the roots from the pelt or skin of the dead animal, and the latter clipped or shorn from the living one. The clipped or fleece wools form the greater part of the wool in market, and these are again divided into long and short staple, or combing and clothing wools. The clothing wools are used mainly for broadcloths and the thicker woolen cloths; the finer combing wools for soft and thin fabrics for women's wear; the medium for worsted goods, delaines, alpacas, mohairs, etc.; and the coarser for carpets, blankets, and coarse goods generally. The quantity of wool grown has increased very rapidly during the nineteenth century, especially in Europe, America, Australia, and Southern Africa. The increase in quantity in Europe and America has been largely due to improved methods of breeding and feeding the sheep, which caused them to mature earlier and to yield larger and more uniform fleeces. Horned Dorsets are the most prized for the production of hot-house or winter lambs. The increase in the consumption of wool in Great Britain has been enormous, and the production has increased. In 1801 the wool-clip of the United Kingdom amounted to 94,000,000 lb., and the imports of unmanufactured wool to 8,000,000 lb. more. In 1828 the production was about 112,000,000 lb., and the imports in round numbers 30,000,000. In 1873 the production was 165,000,000 lb., and the imports 324,000,000, of which 123,000,000 was re-exported. In 1883 the production was 128,000,000 lb., and the imports 508,000,000, of which 277,000,000 was re-exported. In 1892 the production was 153,000,000 lb., and the imports 762,000,000, of which 332,000,000 was re-exported. Large quantities of shoddy, wool extract, and mungo were also consumed. The wool production of France has increased almost as rapidly as that of Great Britain, though mainly in the finer descriptions of wool; but it is now decreasing. France imports also considerable quantities of fine wools from other countries. The Australian colony of New South Wales alone exported in 1893 344,982,876 lb. of wool. Australasia produces the best wool in the world for fine combing purposes. In the U. S. the demands for wool for home manufactures have immensely increased the production, while the amount imported was nearly 55,000,000 lb. in 1875, 67,768,778 lb. in 1885, and 172,435,838 lb. for the year ending June 30, 1893. Importation consists of the merino wools of Australia, the Leicester and other combing wools of high luster for worsted goods, from Canada and Great Britain, and the coarse long-stapled wools from Asia, Russia, and South America for carpets, etc. In 1810 the wool produced in the U. S. was estimated at 13,000,000 lb.; 1880, 264,000,000 lb.; 1890, 309,474,856 lb.; 1891, 307,101,507 lb. These figures are those of James Lynch, continued by Mr. Truitt. In 1840 the average weight of the fleece, as estimated by the Department of Agriculture, was 1·9 lb.; 1850, 2·4 lb.; 1860, 2·7 lb.; 1870, 3·5 lb.; 1880, 4·8 lb.; 1891, 5·5 lb. The scoured wool produced by the growth of 1891 was rated at 139,326,703 lb. The Department of Agriculture estimated the growth for 1891 at 285,000,000 lb.; the imports at 129,303,648 lb.; total consumption after deducting exports, 411,373,603 lb. The percentage of imports was 30·2 per cent., and in 1890 it was 27·6 per cent. The percentage has varied from 21·7 per cent. in 1840 to 44·9 per cent. in 1872, the highest point ever reached. It dropped to 15·6 per cent. in 1879, the lowest point. It was 29·9 per cent. in 1886. The consumption of wool *per capita* in the U. S. was 4·49 lb. in 1840. It increased steadily, and was 8·52 lb. in 1880 and 9·07 lb. in 1890. The world's supply was 955,000,000 lb. in 1860 and 2,456,773,600 lb. in 1890. The latter quantity was distributed as follows:

United Kingdom	147,475,000 lb.
Continent of Europe	639,917,000 "
North America	319,100,000 "
Australasia	550,000,000 "
Southern Africa	128,681,600 "
River Plate country	376,700,000 "
Other countries	294,900,000 "
	2,456,773,600 lb.

The principal European markets for wool are at London and Antwerp. At London periodical auction sales of British colonial wools are held, and are attended by buyers from all manufacturing countries. At Antwerp the bulk of the wools from the important River Plate country is disposed of.

Woolen Manufactures.—The manufacture of wool into fabrics for clothing is one of the oldest industries. At a very early date the primitive man, or rather the primitive woman, discovered that the coarse wool of the sheep, the first of domesticated animals, could be spun into long threads, woven, and then, by rubbing with clay and beating in water, thickened or fulled till it furnished a satisfactory substitute for the pelts of the sheep, which had till then formed the clothing of man. From these rude garments the transition to those of finer and more skillful workmanship, such, for instance, as are shown on ancient Egyptian monuments, was gradual, and must have required long periods of development. The production of dyed garments, of shawls, and

of carpets, often of elaborate patterns and requiring protracted labor, was attempted at a very early period, and the manufacture of tent and curtain cloths, of tapestry hangings embroidered with needlework, and of those vestments of lamb's wool and the rich imperial robes of Tyrian purple came somewhat later. Some of the Persian, Greek, and Roman cloths, robes, and shawls must have been very beautiful; but in the ages which followed the downfall of the Western Roman empire the art of manufacturing them, like most of the fine arts, was nearly lost; the says and serges of the Middle Ages were made from coarse and harsh wools. The rough friezes, made of still coarser wool in Friesland, were still more objectionable, and the manufacture, such as it was, existed mainly in Florence, in Flanders, in England, and in France. After the thirteenth or fourteenth century silks, satins, and velvets became the favorite and distinguishing clothing of the wealthy. Until after the period of the Reformation the manufacture of woolen goods was almost entirely domestic; the large spinning-wheel and the reel had indeed taken the place of the distaff; and the hand-loom, gradually improved, of the rude contrivances of the Oriental weavers. Among the thousands engaged in this domestic manufacture, some possessed greater manual skill and higher ingenuity than others, and consequently their cloths were more in demand; and the assembling of their looms and spinning-wheels in a single building gave them some advantages. The dyeing and fulling of the cloths was a separate business, and for this a water-power was required, and so fulling-mills sprang up wherever there were considerable quantities of cloths made. The use of the teasel for combing out a nap on the fulled cloths dates from an unknown antiquity. There were frauds in those days—stretching of the goods and the extravagant use of flocks. *Flocks* are shorn fibers or the nap cut from the face of one piece of cloth, then fulled into the back of another piece. If judiciously used, they improve the fabric, as they not only increase the bulk, but retard the whole felting process, and thus render the cloth firmer. From the end of the thirteenth to the end of the seventeenth century this domestic manufacture of worsteds, baizes, kerseys, serges, friezes, broadcloths, and other cloths was carried on very extensively in England, and considerable quantities of each were exported. The English cloths were mainly of coarse qualities, and inferior to some of those made on the Continent, the Spanish and Flemish fine wools enabling them to make finer and more desirable goods. In the eighteenth century the manufacture of both worsteds and woolens began to be concentrated in Yorkshire, and Leeds, Stroud, Chippenham, and Huddersfield gradually became the seats of the woolen goods manufacture; while Bradford, Halifax, Norwich, and their vicinities absorbed the manufacture of worsted goods and carpets. But, though large quantities of goods were made and sold, their quality was far from uniform, and there was no improvement in the processes of manufacture until the invention of the carding-machine, which first came into use for wool in England about 1753, and the SPINNING-JENNY (*q. v.*). The gradual introduction of these machines, and the application of steam both as a motor and for dyeing and dressing purposes, greatly improved the character of the English and French cloths, but until the introduction of the power-loom (which, though invented in 1785, did not come into general use till about 1800) and the Jacquard loom (invented in 1811), the woolen and worsted manufactures had not received their greatest impulse in Great Britain. The French manufacturers were moving meanwhile in a somewhat different direction. With their fine and soft wools they directed their attention very largely to the production of fabrics for women's wear, and with their admirable taste and delicacy of workmanship soon achieved great success. The French merino goods, introduced by Pallotan at Rheims in 1801, have never been surpassed by any all-wool product in softness, durability, and beauty. Other goods, both of wool and worsted, pure and in combination with silk, cotton, and linen, have been produced in vast quantities in England and France. The broadcloths of the highest grade made in France are of better quality than any others, except some of the west of England goods; but the practice of adulterating these, as well as cassimeres, satinets, and indeed almost every description of the heavier wool goods, with shoddy or the ground and picked fibers of old woolen rags, first undertaken in 1813 at Batley, England, but not largely used till 1840, has done much to impair the value and durability of the lower and medium priced goods. This practice has been carried to a greater excess in Great Britain and Belgium than elsewhere. The modern *shoddy* is fiber of yarns or threads picked and broken into the semblance of wool. *Mungo* is the fiber of felted rags thus picked. Both these articles, being mixed with wool, are carded and spun; they are never fulled or carried into the fabric like flocks.

In the U. S. the manufacture of woolen goods was almost entirely domestic as late as 1790, and though there had been fulling-mills from the first settlement of the colonies, there was no woolen-factory in successful operation before 1794, when one was established in Byfield parish, Newbury, Mass. An attempt had been made at Hartford in 1788. In 1794 the first carding-machine for wool was put in operation in Pittsfield, Mass. Between that time and 1801 four or five were started. Gray-mixed broadcloth of good quality was made at Pittsfield in 1804, and President Madison's inaugural suit of black broadcloth was made there in 1808. In 1809 a woolen-mill was erected by Dr. Capron at Oriskany, Oneida co., N. Y., and in 1812 what was then considered a large manufactory of fine cloths was established at Middletown, Conn., which made 30 or 40 yards of broadcloth a day. In the same year were produced what are known as the helicoidal shears, a cutting-machine with spiral blades on a cylinder acting against a straight steel blade, and shearing the nap of the cloth evenly and perfectly. This was first adopted in France. To the inventors of the U. S. the world is indebted for the original and best processes for making felted goods, carpetings, hat-bodies, etc.; the knitting-frame, and later the various knitting-machines, the burring-machine, the Crompton and Knowles power-looms for weaving fancy cassimeres, which, with their successive improvements, are now far superior to any other loom for this purpose; the still more wonderful automatic Bigelow carpet-loom; the best processes for making a mixed mousseline delaine; Crompton's improvement of Noble's wool-comb; and the Smith moquette carpet-loom. The woolen-manufacturers in the U. S. have had great difficulties to contend with. In addition to the high price of labor as compared with European countries, and the lack for many years of native wool of those qualities best adapted to their use, they have been unduly affected by high and low tariffs, and their goods systematically depreciated by the importers and free-traders; but they have at length reached a position in which they can supply more than three-fourths of the woolen and worsted goods consumed at home, and, except in a few classes of goods, produce those of quality equal to those of their European rivals.

From 1790 to 1810 there was a large domestic manufacture in proportion to the population, and the greater part of the men and all the boys were clothed in homespun, while the women wore for everyday use linsey-woolsey, a fabric composed of linen and wool. In 1810 the value of this domestic manufacture was estimated at $25,608,788. But after this date the domestic production fell off rapidly, and at first the factory-made goods did not supply their place. In 1820 the total value of woolen goods reported was $4,413,068; in 1830, $14,528,166; in 1840, $20,696,999; in 1850, $49,636,881; in 1860, $80,734,060; in 1870, $217,668,826. In 1876, owing to the depression of business, there was a slight falling off in production, and a still larger one in importation. The value of the woolen goods produced in 1880 was $267,252,913; in 1890 it had risen to $337,768,524, of which $137,930,014 was in woolen goods proper, $72,194,642 in worsted goods, $8,958,205 in felted goods and hats, $39,769,441 in carpets, and $55,457,642 in hosiery and knit goods. Massachusetts has from the first maintained the leading position in these manufactures, her production of all-wool goods, carpetings, worsted, and mixed goods of cotton, linen, or silk and wool, amounting in 1890 to $72,681,408, or more than one-fourth of the whole production of the country. Pennsylvania, New York, Connecticut, and Rhode Island are the other largest producers, though nearly every State has some woolen manufactures. The value of importations in 1821 was $7,238,954; in 1831, $13,197,364; in 1840, $10,808,485; in 1850, $19,620,619; in 1860, $43,141,988; in 1870, $37,064,001; in 1880, $35,356,992; in 1890, $56,582,432; in 1891, $41,060,080.

Processes.—The variety of goods wholly or in part made of wool, and of those wholly or in part of worsted, is so great that the processes to which each is subjected in its manufacture can only be named in the most general way. The distinction between the woolen and worsted goods begins in the character of the wool used; for all heavy wool goods a more or less fine, short-stapled, and readily felting

wool is required; for goods wholly or in part of worsted the wool must be strong in fiber, of long staple (fibers 2½ to 5 or 6 inches in length, although shorter wool can be combed), not very fine, and either naturally or by the combing process freed from the noil or short fiber, which is afterward mixed with wool, carded, and spun for felted goods. The wool, which is usually purchased in bales, is first sorted and scoured. The sorter arranges the parts of each fleece according to fineness, length of staple, and silkiness of texture; and the scouring is accomplished by throwing the wool into large tanks filled with water and an abundance of soap, keeping it at a high temperature by means of steam, and continually moving it by means of rakes or stirring-sticks driven by machinery. When thoroughly cleansed it is drawn out through rollers to squeeze out the water, and then dried by revolving fans or other means. By this scouring and washing not only is the dirt and soil removed from the fleeces, but the yolk or suint—a peculiar fatty secretion of the sheep most abundant in the merino breeds—is also discharged. The British manufacturers extract these matters from the water by a chemical process, and make *dégras*, a low form of grease, from the product. Similar processes for extracting the fat are now being introduced into the U. S. The wool is next dyed (if it is necessary to dye it in the wool). The next process is willying, or, in the case of Western and South American wools, burring. The object of this is to remove seeds and burs which have become entangled in the wool. The American burring-machines of various kinds do this very perfectly and in combination with the carding-machine. Picking, teasing, or moating is the next process, and is performed by a machine which tears open the matted portions and separates the wool into small tufts. Either before or immediately after this process the wool is oiled, oleic acid or olein being now generally used for this purpose, instead of olive oil, and sometimes a mixture of olein and paraffin oil; these oils are much more readily removed from the yarn or tissues by a brief scouring with carbonate of soda and pure water than the olive oil, and there is much less danger of spontaneous combustion than from the use of the vegetable oils. The wool is now ready for the carding and slubbing processes, which, though formerly separate, are now continuous by the use of a patent feeder and condenser. Their office is to convert the wool into rolls, which are drawn out before they are spun. The spinning is the next process, and herein is another difference between woolen and worsted yarns, the yarns for woolen cloths being but slightly twisted, so as to leave them more free for felting, but those for the warp twisted more than those for the weft, as they have to bear more strain; while the worsted yarns are hard-spun and made into a much stronger thread. The slight twisting and comparative lack of strength in woolen yarn renders it more difficult to weave it on a power-loom than the worsted, cotton, silk, or linen yarns. The yarn, when spun, is reeled, and, if to be made into cloth, warped, beamed, sized, and otherwise prepared for weaving. The weaving is generally done on an ordinary power-loom for broadcloths, flannels, cassimeres, satinets, blankets, etc.; on a Crompton chain-loom for fancy cassimeres, yarns of different colors being introduced; or on the Earnshaw needle-loom, where the goods are made with two faces or different colors are used. Broadcloths, and indeed most woolen goods, are next scoured to remove the oil, and then, if thought necessary, dyed again, and tentered or stretched upon hooks to dry. Burling, or picking off irregular threads, hairs, and dirt, succeeds this, and then, for the cloths, come the fulling process and the teaseling or raising the nap, which is sheared evenly by the helicoidal shears. It is next steamed or scalded to prevent its spotting unevenly from the rain, and pressed between polished iron plates in a powerful hydraulic press, or, as is more common now, in a rotary or calendaring press. The flannels, blankets, etc., do not go through these last processes. The knit goods are made from the yarn on knitting-machines, and finished by hand. Delaines have usually cotton warp, and are woven on cotton looms, and printed, like calicoes, from rollers. Merinos, Tibets, empress and Henrietta cloths, alpacas, with many other kinds of dress goods, are made from worsted yarns. Carpets are made from coarser wools, and do not go through so many preliminary processes before spinning; they are woven on the Bigelow carpet-looms, or some modification of them. The worsted wools are combed on a combing-machine with teeth heated by indirect application of steam, to make the fibers straight and parallel, and the noil or shorter fiber is combed out. The other processes before the spinning are much the same as already described. But the spinning of worsted and woolen yarns is entirely different. Woolen is drawn finer by the draft of the mule carriage after the roving passes through rollers. Worsted is drawn between rollers as a cotton thread. The front pair of rollers runs faster than the back pair, and thus the size is reduced. Then the thread is twisted by the revolutions of the spindle. The yarns are hard-twisted, and for some purposes, as for alpacas, mohairs, and lustered goods, the lustered wools and the hair or wool or the alpaca and vicuna and of the angora goat are used. The weaving and dyeing of these goods are watched with great care. The cow's hair, camel's hair, and calf's hair goods are of cheaper grades, and in quality belong rather to the woolen than the worsted trade. Most of them contain a considerable proportion of the lower grades of wool, woolen waste, and shoddy. Revised by W. B. WEEDEN.

Woollet, WILLIAM: engraver; b. at Maidstone, England, Aug. 15, 1735. His father apprenticed him to an engraver named John Tinney, and he also studied in the St. Martin's Lane Academy. Woollett earried landscape-engraving to an unsurpassed degree of excellence; his success with historical subjects was also great. Among his plates (123 in number) are those of West's *Death of Wolfe* and *Battle off Cape La Hogue*, and those after Van Dyck, Claude Lorraine, Villement, Zuccarelli, and Richard Wilson. Woollett belonged to the St. Martin's Lane Academy and the Incorporated Society of Artists elected him in 1766. He was also appointed engraver to the king Nov. 27, 1775. He had the habit of firing off a cannon from his roof when he had finished an important plate. D. May 23, 1785, in London. See Louis Fagan's *Catalogue Raisonné of the Engraved Works of William Woollet* (London, 1885). W. J. S.

Woolner, THOMAS: sculptor and poet; b. at Hadleigh, Suffolkshire, England, Dec. 17, 1826. He was a pupil of the sculptor William Behnes, and exhibited his first work at the academy in 1843. Genre works occupied his attention during his youth, such as *Titania with her Indian Boy*, a bas-relief *Feeding the Hungry*, and *The Rainbow*. He also produced busts of Carlyle and Tennyson. In 1849 he was active in the association called PRERAPHAELITES (*q. v.*). In 1853 or 1854 he went to Australia, and after his return in 1857 he produced the remarkable bust of Tennyson which was set up in Westminster Abbey after the poet's death. At about this time he produced the medallion portrait of Tennyson, an engraving of which forms the frontispiece of the Moxon edition of Tennyson's poems published in 1857. From this time on he was actively employed and produced many notable works. In 1871 he was made associate of the Royal Academy, in 1874 an academician, in 1877 Professor of Sculpture in the Royal Academy, an office which he resigned in a few years. D. in London, Oct. 7, 1892. His poem *My Beautiful Lady*, which first appeared in the periodical issued by the Preraphaelites, was published as a volume in 1863 and has been through several editions. He also published volumes of poems under the titles *Pygmalion* (1881), *Silenus* (1884), and *Tiresias* (1886).

Woolrych, HUMPHREY WILLIAM: b. in England in 1795; entered Oxford with the intention of taking orders in the Church, but upon graduation took up the study of law and was called to the bar at the Inner Temple in 1821; became eminent as a barrister on the western circuit and the home circuit, and in 1855 was made serjeant-at-law. D. in London, July 2, 1871. He was a prolific writer, and was the author of a *Life of Sir Edward Coke* (1826); *Series of the Lord Chancellors, Keepers of the Seal, etc.* (1826); *Memoirs of the Life of Lord Jeffreys* (1827); and *Lives of Eminent Serjeants-at-Law* (1869); and of a number of legal treatises, of which those on the *Law of Ways* (1836), the *Law of Misdemeanor*, and on the *Law of Sewers, including the Drainage Acts*, have a present value. F. STURGES ALLEN.

Woolsey, SARAH CHAUNCEY: author; b. at Cleveland, O., about 1845; a niece of Theodore D. Woolsey, and a favorite writer for children under the pseudonym of Susan Coolidge. She resided a number of years at New Haven, Conn., and subsequently at Newport, R. I. Among her books are *The New Year's Bargain* (1871); *What Katy Did* (1872); *Verses* (1880); *A Guernsey Lily* (1881); *A Little Country Girl* (1885); and *A Short History of the City of Philadelphia* (1887). She edited *The Diary and Letters of Mrs. Delaney* (1878) and *The Diary and Letters of Frances Burney, Madame d'Arblay* (1880). HENRY A. BEERS.

Woolsey, Theodore Dwight, D. D., LL. D.: educator; b. in New York, Oct. 31, 1801; graduated at Yale College 1820; read law in the office of Charles Chauncey, Esq., in Philadelphia; studied theology at Princeton; was a tutor in Yale College 1823–25; licensed to preach in 1825; studied Arabic, Greek, and modern languages abroad 1827–30; elected Professor of Greek in Yale College in 1831; elected president in 1846, resigned this office in 1871; resided in New Haven, and for a time lectured in the law school, and was busily occupied in researches and studies chiefly in political science; was ordained at the time of his inauguration, and frequently preached in the college chapel and elsewhere with great acceptance; edited the *Alcestis* of Euripides (1833), the *Antigone* of Sophocles (1835), the *Electra* of Sophocles (1837), the *Prometheus* of Æschylus (1837), the *Gorgias* of Plato (1842); published his inaugural discourse on *College Education* (1846); an *Historical Discourse upon Yale College* (1850); *An Introduction to the Study of International Law* (12mo, Boston, 1860: 4th ed. New York, 1874); *An Essay on Divorce and Divorce Legislation* (New York, 1869); a volume of sermons entitled *The Religion of the Present and the Future* (New York, 1871). After the death of Prof. Francis Lieber (1872) President Woolsey re-edited, with notes, his work on *Civil Liberty and Self-Government* (Philadelphia, 8vo, 1874), also his *Manual of Political Ethics* (2 vols. Philadelphia, 1874). President Woolsey was for several years one of the regents of the Smithsonian Institution, and was a member and the chairman of the American division of the committee for the revision of the New Testament. He published a work on *Political Science* in 1877, in two vols., and a book on *Communism and Socialism* in 1879. D. in New Haven, Conn., July 1, 1889.

Woolsey, Theodore Salisbury, A. M., LL. B.: professor of international law; b. in New Haven, Oct. 22, 1852; son of Theodore Dwight Woolsey; educated at Yale University (A. B. 1872, LL. B. 1876, M. A. 1877); traveled for two years in Europe and Asia; studied for two winters in Germany; in 1877 became instructor in public law in Yale College; in 1878 Professor of International Law in the same institution; editor of Pomeroy's *International Law* (1886) and the sixth edition of Woolsey's *International Law* (1891); associate editor *Johnson's Universal Cyclopædia*, in charge of the department of public law and intercourse of nations (1892–95).

Woolson, Constance Fenimore: novelist; b. at Claremont, N. H., Mar. 5, 1838. Her mother was a niece of James Fenimore Cooper. She was taken, when a child, to Cleveland, O., and was educated there and at the school of Madame Chegaray in New York city. She resided at Cleveland till 1869, spending her summers on the island of Mackinac. From 1873 to 1879 she lived in the South, chiefly in Florida and in the mountain districts of Virginia, Georgia, and the Carolinas. In 1879 she went to Europe and resided principally in Italy till her death, which occurred at Venice, Jan. 24, 1894. The scenes of her stories were commonly in the South and in the region of the Great Lakes. Besides tales, sketches, and poems in the magazines, which remain in part uncollected, she is the author of the following books: *Castle Nowhere* (1875); *Rodman the Keeper* (1880); *Anne* (1882); *For the Major* (1883); *East Angels* (1886); *Jupiter Lights* (1889); and *Horace Chase* (1894). H. A. B.

Woolsorter's Disease: See Anthrax.

Woolston, Thomas: deist; b. at Northampton, England, in 1669; studied at Sidney-Sussex College, Cambridge; took his degree about 1688; became a fellow of Sidney-Sussex; took orders in the Church of England; made a careful study of the works of Origen; wrote *The Old Apology for the Truth of the Christian Religion against the Jews and Gentiles revived* (1705), in which he maintained, ostensibly in the interest of Christianity, that many seemingly historical portions of the Bible, including the Pentateuch, are to be interpreted allegorically, Moses and his miracles being merely types of Christ; was deprived of his fellowship 1721 on account of the scandal occasioned by his writings; published *The Moderator between an Infidel and an Apostate: or the Controversy between the Author of the Discourse of the Grounds and Reasons of the Christian Religion* [Anthony Collins]; *and his reverend ecclesiastical opponents; set in a clear light* (1725) and *Six Discourses on the Miracles of our Saviour* (1727–29), addressed to six bishops, in which he maintained the allegorical character of those miracles. Woolston was in consequence indicted for blasphemy at the instance of the attorney-general, tried, and convicted at the Guildhall, London, Nov., 1729, fined £100, imprisoned for a year in the King's Bench prison, and failing to provide security for not repeating the offense, spent the rest of his life within the rules of that prison, dying Jan. 21, 1731. He was probably somewhat deranged. See his collected works with *Life* (5 vols., London, 1733). Revised by S. M. Jackson.

Wool-tree: See Eriodendron.

Woolwich, wōōl'ich: town; county of Kent, England; on the southern bank of the Thames; 9 miles below London Bridge (see map of England, ref. 12–K). It extends for a distance of 2 miles along the river. This is also the seat of the chief arsenal of England, covering over 100 acres, and contains all the different kinds of workshops in which cannons, bombs, shells, etc., are made. It has the Royal Military Academy and extensive barracks. (See Military Academies.) Woolwich is now a part of London. Pop. (1891) 40,848, and of the parliamentary borough, returning one member, 98,976; (1901) 117,165.

Woonsock'et: city; Providence co., R. I.; on the Blackstone river, and the N. Y. and New Eng. (now New Eng.) and Prov. and Worcester Div. of the N. Y., N. H. and Hartford railways; 16 miles N. by W. of Providence and 37 miles S. W. of Boston (for location, see map of Rhode Island, ref. 7–N.). It is a consolidation of what were isolated factory villages; hence its streets are irregular, but not without beauty. A century ago the region now called Woonsocket was a wilderness. The village then called Woonsocket, and which contained the post-office, bank, tavern, etc., of the locality, has not only relinquished these institutions, but is now not even included within the limits of the city to which it gave its name. The present Woonsocket was set off as a town from Cumberland in 1867, enlarged by the addition of a part of Smithfield in 1871, and incorporated as a city June 13, 1888. The river is here crossed by a magnificent bridge whose construction cost $300,000. Woonsocket has three parks and a fair-ground, and a soldiers' monument gives name to the principal square. The leading industries are cotton, woolen, and rubber manufactures, with an aggregate capital of $4,500,000, and giving employment (1895) to 5,646 persons; besides these there are several machine-shops, a sewing-machine, wringing-machine, shuttle, reed, harness, and bobbin factory, and extensive gas and electric plants. The water-works has a daily capacity of 3,000,000 gal. The city contains 6 national banks, with an aggregate capital of $850,000, and 4 savings institutions with deposits of about $8,000,000. Woonsocket has 18 school-houses, with 75 teachers and 2,500 pupils, besides 1,800 who attend the parochial schools and 45 in a kindergarten. There are 3 Roman Catholic churches, 2 Episcopalian, while the Baptists, Methodists, Congregationalists, Presbyterians, Universalists, and Second Adventists have one each. The Friends meeting-house is just outside the city limits, on a site which has been owned by them for more than a century. The city also has a free public library of about 13,850 volumes, one weekly and 3 daily newspapers, 2 opera-houses, and 3 hotels. The assessed valuation in 1894 was $13,862,150, its rate of taxation $0·0135, and its net debt, including water bonds, $1,371,426. Pop. (1880) 16,050; (1890) 20,830; (1900) 28,204. Erastus Richardson.

Woorari, or **Woorara**: See Curari.

Wooster: city (founded in 1808); capital of Wayne co., O.; on the Balt. and Ohio and the Penn. railways; 25 miles W. of Massilon, 52 miles S. S. W. of Cleveland (for location, see map of Ohio, ref. 3–G). It is in an agricultural region; has 12 churches, high school, 5 ward schools, city-hall, court-house, water-works, electric lights, 2 national banks with combined capital of $175,000, and a daily, a quarterly, 5 weekly, and 2 monthly periodicals; and has manufactories of pianos, engines, boilers, mill-gearing, flour, furniture, harness, paving-brick, carriages and wagons, and door, sash, and blinds. Wooster is the seat of the Ohio agricultural experiment station, and of Wooster University, a coeducational institution of learning under the control of the Ohio Synod of the Presbyterian Church. The university was founded in 1866 and opened in 1870; its buildings, of brick, cost $190,000, and its endowment is $370,000. There are collegiate, preparatory, post-graduate, and music departments, besides a medical department located at Cleveland. The instructors number (1900) 28; students, 450; and collegiate alumni, 1,015. Pop. (1880) 5,880; (1890) 5,901; (1900) 6,063. Editor of "Republican."

Wooster, DAVID: soldier; b. at Stratford, Conn., Mar. 2, 1710; graduated at Yale College 1738; commanded a sloop-of-war in the expedition against Louisburg 1745; went to Europe in charge of a cartel-ship; visited England; was presented at court and made a captain in Pepperell's regiment; was appointed colonel of the Third Connecticut Regiment 1755; served as brigadier-general in the northern campaigns of 1758–60; was one of the originators of Arnold's expedition for the capture of Ticonderoga Apr., 1775; was appointed brigadier-general June 22, 1775; succeeded to the command in Canada on the death of Montgomery; became major-general of State militia 1776; mortally wounded in the defense of Danbury against Tryon, dying there May 2, 1777. A monument was erected by the State in 1854.

Worcester, wŏos'ter, or **Worcestershire** [*Worcester* is O. Eng. *Hwicwaraceaster*, liter., camp of the Huiccii; Lat. *Huiccii*, name of a people in Britain + *cas'tra*, camp]: an inland county of England, on both sides of the Severn and its affluent, the Avon. Area, 751 sq. miles. The surface is undulating and well wooded; the elm grows luxuriantly, and has received the name of the weed of Worcestershire; fruit-trees also succeed well. Wheat, hops, vegetables, and pears are extensively cultivated. Coal and iron abound, and about one-third of the inhabitants are engaged in mining. Among the different manufactures which are carried on are those of carpets at Kidderminster, the most remarkable, glass and iron wares at Dudley and Stourbridge, gloves, porcelain, needles, and fish-hooks. Pop. (1901) 358,357.

Worcester: city of England; capital of Worcestershire; on the Severn; 27 miles by rail S. W. of Birmingham (see map of England, ref. 10–G). The principal feature is the cathedral, which, founded in 679, was rebuilt after 1084 and restored since 1857. It is principally Early English and Decorated in style. It is 410 feet long, 126 feet wide, and 60–67 feet high. Tanning, currying, dressing, and staining of leather, glove-making, the manufacture of porcelain, vinegar, sauce, and chemicals are the principal branches of industry, and several of them—as, for instance, those of sauce, china, and gloves—enjoy a great reputation. Worcester returns one member to Parliament. Pop. (1901) 46,620.

Worcester: city; capital of Worcester co., Mass.; on the Blackstone river, and the Boston and Albany, the Boston and Maine, and the consolidated railways; 44 miles W. of Boston (for location, see map of Massachusetts, ref. 3–G). The settlement, begun in a valley, has spread over and beyond adjacent hills, and the natural advantages for beauty, health, and convenience are unsurpassed.

Plan and Government.—The principal business thoroughfares are Main Street, running generally from N. to S., about 3 miles, and having most of the largest and finest business blocks and trades-houses extending for half its length; and Front Street, running E. from the common to the Union railway station, one-third of a mile. The city is well supplied with pure water, and there is an extensive sewerage system. An extensive electric-railway system accommodates all parts of the city and communicates with many of the adjoining towns. There are 11 public parks, aggregating 360 acres. The city is divided into 8 wards, the boundary-lines of which diverge from the center like the spokes of a wheel. The government is vested in a mayor, 9 aldermen, and a common council of 24 members. The total expenditure for city maintenance in 1900 was $4,776,336. The property valuation in 1900 was $112,043,973, the net debt $5,501,798; tax-rate, $16.40 per $1,000. There are 7 banks for discount and a safe deposit and trust company with a capital of $1,850,000, and 5 savings-banks with deposits of over $40,000,000.

Churches, Schools, etc.—Worcester possesses few striking specimens of architecture; Mechanics' Hall building, the new city-hall, the new court-house, Art Museum, and the State Mutual Life Insurance Building are the most pretentious. Other important buildings are the Armory, the new U. S. building, the Oread Institute, the Worcester Academy buildings, Holy Cross College, and CLARK UNIVERSITY (*q. v.*). There are 102 church organizations and 83 edifices. Of these, 18 are Orthodox Congregational, 3 Unitarian, 16 Baptist, 12 Methodist Episcopal, 11 Roman Catholic, and 4 Protestant Episcopal. The schools of Worcester are noted for their excellence. The number of pupils registered in 1900 was 19,133; average attendance, 17,134; teachers employed, 625; appropriation for school maintenance in 1900, $530,000. There are 3 high schools—the Classical, the English, and one uncompleted. Seven parochial schools are maintained by the Roman Catholic Church, three of which are French, with a total of 3,000 pupils. There are also several excellent private schools. The higher educational institutions are the Roman Catholic College of the Holy Cross, founded in 1843, the Polytechnic Institute for practical training (see WORCESTER POLYTECHNIC INSTITUTE), the State Normal School, the Worcester Academy, and Clark University. The Free Public Library, with a circulating department and a reading-room, has a total of 133,000 volumes. The library of the American Antiquarian Society contains over 100,000 volumes. Various smaller libraries with the above make a total of 350,000 volumes for public use. There is an active and prosperous Mechanics' Association, whose hall is one of the finest in the U. S. The Agricultural and the Horticultural Societies, the Worcester County Musical Association, the Natural History Society, and The Worcester Society of Antiquity are prominent organizations. There is a flourishing board of trade. The principal social clubs are the Worcester, the Commonwealth, and the Hancock. The Y. M. C. A. and the Y. W. C. A. own each a fine building. Four daily papers and several weekly and other periodicals are published.

Charitable and Benevolent Institutions.—The City Hospital for general medical and surgical cases and the Washburn Memorial Hospital for the treatment of women and children, and St. Vincent's Hospital are well endowed. There is also a Homœopathic Hospital and several private ones. Two State hospitals for the insane are located here. The State Odd Fellows' Home was opened in 1892, and there are homes for aged men and women, orphan asylums, and many other charitable establishments. The county jail is the only penal institution.

Manufactures.—Worcester produces a greater variety of manufactured articles than any other city in the U. S. The wire-mills of the Washburn & Moen branch of the American Steel and Wire Company are the largest in the world, employing 4,000 persons. Loom manufacture comes next in importance. One-third of the envelopes used in the U. S. are made here. The boot and shoe industry is extensively carried on. Every kind of machine used in a woolen or cotton mill is made here. There are 1,415 manufacturing establishments, with $23,000,000 capital, employing 22,000 persons, who receive over $10,000,000 per annum in wages. Material to the value of $21,000,000 is used in manufacturing, and the total output has a value of over $40,000,000.

History.—Worcester was first settled in 1675 under the name of Quinsigamond Plantations. The pioneers were soon driven away by the Indians, and their buildings destroyed. A second settlement in 1684 met the same fate after a few years. In 1713 the third and permanent settlement was made. The first church was organized in 1719, and the town was incorporated in 1722. In 1775 ISAIAH THOMAS (*q. v.*) removed his press from Boston to Worcester, and during 1790–1800 carried on the most extensive publishing business in the U. S. From the steps of the old South church the Declaration of Independence was read for the first time in Massachusetts. The opening of the Blackstone Canal in 1828, and of the railways which superseded it, caused the town to grow rapidly, and it was incorporated as a city in 1848. From its central situation in the State, in its richest agricultural section, Worcester has long been known as the "Heart of the Commonwealth." Pop. (1890) 84,655; (1895) 98,767; (1900) 118,421. FRANKLIN P. RICE.

Worcester, DEAN CONANT: See the Appendix.

Worcester, EDWARD SOMERSET, Second Marquis of: b. at Raglan Castle, England, about 1601, was the eldest son of Henry Somerset, Lord Herbert of Chepstow, created in 1642 first Marquis of Somerset; spent some years in foreign travel; married in 1628; devoted himself to mathematical and mechanical researches at Raglan Castle; entered the military service of Charles I. in 1641, along with his father, raising and commanding a body of troops; was known from 1642 by the courtesy title of Lord Herbert; is alleged to have been created Earl of Glamorgan by Charles I. Apr. 1, 1644; was sent to Ireland as a secret agent of the king to treat with the Irish Roman Catholics 1645; was imprisoned on the discovery of his errand, and at first disowned by the king; was released, and succeeded his father in 1646, and went into voluntary exile in France Mar., 1648; returned to England 1652; was imprisoned in the Tower 1652–55; drew up while in the Tower a little work entitled *A Century of the Names and Scantlings of such Inventions as at*

present I can call to mind to have Tried and Perfected, etc. (1663), in which he describes a steam-engine as "an admirable and most forcible way to drive up water by fire," and spent a large sum of money upon the erection of waterworks at Vauxhall. D. Apr. 3, 1667. A well-written account of his *Life, Times, and Scientific Labors* (1865), including a reprint of the *Century of Inventions*, was issued by Mr. Henry Dircks, who also published *Worcesteriana* (1865), consisting of notices of 180 works relating to the marquis or his connections.

Worcester, Joseph Emerson: lexicographer; b. at Bedford, N. H., Aug. 24, 1784; graduated at Yale College 1811; taught school at Salem, Mass.; studied theology two years at Andover Seminary; settled at Cambridge, Mass., 1819, and devoted himself thenceforth to the preparation of a series of valuable text-books and of his dictionary, for which purpose he visited Europe 1830–31. D. at Cambridge, Oct. 27, 1865. Among his works were a *Geographical Dictionary, or Universal Gazetteer* (2 vols., Andover, 1817); *Elements of Geography, Ancient and Modern* (1819; several editions); *Sketches of the Earth and its Inhabitants* (2 vols., 1823); *Elements of History, Ancient and Modern* (1826); *Elements of Ancient Classical and Scripture Geography* (1828); *The American Almanac* (1831–43); a revised edition of Todd's *Johnson's Dictionary* (1828); an abridgment of *Webster's Dictionary* (1829); a *Comprehensive Pronouncing and Explanatory Dictionary of the English Language* (1830); a *Universal and Critical Dictionary* (1846); and his great work, *A Dictionary of the English Language* (Boston, 1860, with 1,000 illustrations).

Worcester, Noah, D. D.: clergyman; b. at Hollis, N. H., Nov. 25, 1758; received only a common-school education; served three years as fifer and fife-major in the Continental army 1775–77, being present at Bunker Hill and at Bennington; was licensed to preach 1786; was pastor of the Congregational church at Thornton 1787–1809; removed to Salisbury, N. H., 1810, supplying there the pulpit of his brother Thomas until 1813, when he settled at Brighton, Mass.; edited the *Christian Disciple* 1813–19, and a quarterly magazine, the *Friend of Peace*, 1819–29; founded the Massachusetts Peace Society in Jan., 1816; was its secretary until 1828; published *Solemn Reasons for Declining to adopt the Baptist Theory and Practice* (Charlestown, 1809); *Bible News, or Sacred Truths relating to the Living God, His Only Son and Holy Spirit* (Concord, 1810), which was censured by the Hopkinton Association as unsound on the doctrine of the Trinity; *Impartial Review of Testimonies in Favor of the Divinity of the Son of God* (1810), and other controversial treatises against the Trinitarians; *A Solemn Review of the Custom of War* (1814; 11th Amer. ed. 1833); *The Atoning Sacrifice a Display of Love, not of Wrath* (Cambridge, 1829); *The Causes and Evils of Contentions among Christians* (Boston, 1831); and *Last Thoughts on Important Subjects* (Cambridge, 1833). D. at Brighton, Oct. 31, 1837. A *Memoir* (1844) was issued by Rev. Henry Ware, Jr., D. D. Revised by G. P. Fisher.

Worcester Polytechnic Institute: a school of engineering at Worcester, Mass.; founded by John Boynton, of Templeton, Mass., in 1865, by a gift of over $100,000. This was soon followed by a gift from the Hon. Ichabod Washburn, of a large and very well equipped machine-shop for the training of students pursuing the course in mechanical engineering, and a handsome endowment for the maintenance of the same. Further gifts were received from others, including the Commonwealth of Massachusetts, by means of which extensive buildings were erected, and the annual income of the institute from all sources was made to exceed $60,000. The buildings occupy a prominent and beautiful location in the city of Worcester, the grounds belonging to the institute including about 11 acres. They are adjacent to a beautiful park in a part of which the right to erect buildings in the future belongs to the corporation of the institute. The principal buildings are Boynton Hall, the Washburn machine-shops, the Salisbury laboratories of physics and chemistry, the large and completely equipped Engineering laboratory built by funds appropriated by the commonwealth, the Power laboratory, magnetic laboratory, etc. There is also an extensive hydraulic laboratory about 4½ miles distant from the other buildings, where there is water-power of 80 horse-power and a completely equipped testing plant, including turbine wheels, a large Venturi and other meters, weirs, water-rams, and other apparatus. There are five courses of study, i. e. civil engineering, mechanical engineering, electrical engineering, chemistry, and general science. The institute confers the degree of Bachelor of Science. There are (1899) 30 instructors and 237 students. Its graduates are almost entirely employed in the various branches of engineering, a few having become teachers and college professors. One of the distinctive characteristics of the school is the thorough practical training which it gives in the Washburn shops to students of mechanical engineering. The constructive idea is dominant. From the beginning every student works on some part of a machine which he afterward assembles, and the whole is subjected to the actual tests of practical use. In this way the invention, design, construction, test, and use of machinery are systematically taught. The extensive laboratories of physics, electricity, chemistry, and engineering are managed in harmony with the same general principle. T. C. Mendenhall.

Word [O. Eng. *word*: O. H. Germ (> Germ.) *wort*: Icel. *orð*: Goth. *waúrd* < Teuton. *word-* < Indo-Eur. *u̯rdhom* > Lat. *ver'bum*, word: Lith. *vardas*, name]: the smallest detachable portion of a sentence, i. e. the smallest sentence-segment which, when abstracted, still suggests its possible sentence functions. The term has two senses: (1) *particular word*, the single concrete utterance in an actual sentence, e. g. *book*, in *give me the book*; (2) *general word*, or the psychical word-picture generalized out of, and serving as substrate to, all the concrete occurrences of identical or similar forms, e. g. Eng. *book* vs. Fr. *livre*. In both these senses the real word may be different from our naming of it, e. g. in *I'd go 'f I could*, the second and fourth real particular words are *'d* and *'f*, their names are *would* and *if*; the real general Eng. word "*n*" is named *and*. See Ablaut.

Sentences as Words.—Actual language consists always of sentences. The real particular word exists only as an organic part of an actual sentence, and the real general or psychical word only as implicitly capable of filling one or more places in any appropriate sentence type. In primitive language (whether individual or racial) the sentence is an undivided whole, and words and sentences are identical ("incorporating" languages). Individual parts may have a clearly felt force, but the native mind does not recognize their sentence function when abstracted; e. g. Massachusetts (Indian) *wut-appesituqussun-nooweht-unk-quoh*, lit., he-came-to-a-state-of-rest-on-bended-knees-doing-reverence-to-him; Accadian *in-bat*, he-opened, *in-nin-bat*, he-opened-it, *in-śub-śube*, he-built-a-building; Basque *didac*, I-have-it-for-you, *dizut*, you-have-it-for-me. Purely pronominal sentences often remain incorporating (i. e. single words) even in highly developed inflectional and agglutinative languages, e. g. Arab. *aqtala*, he caused to kill; Congo *wamrondisa*, he caused him to kill. Word-order in Japanese is the same as if the whole sentence were still one compound word. In all languages a large class of emotive (and volitive) sentences must always remain sentence-words, because the emotive psychical states, and hence the sentences expressing them, do not admit of sub-organization, e. g. *pshaw! horrors! shoo!*

Sentence-members as Words.—Speakers of every language in time develop a limited number of *sentence-types* or generalized psychical pictures of sentence-structure. Every actual sentence must thereafter approximately embody one of these types, and consist of *sentence-members* conforming to the general structure-picture, e. g. *the boy—runs, the rain—fell in torrents* are both sentences of the "simple declarative" type having as members a subject and predicate; *the man—who saw him—told me* is of the complex declarative type, etc. As fast as these psychical types succeed in reshaping language, sentence-members take the place of sentences as words (polysynthetic languages), e. g. Magyar *kesem*, my-knife; Lhōtā Nāgā *ōyāṅ*, village, *nīyāṅ*, your-village, *yāntzū*, large-village, *kyōntzüyāṅ*, all-villages, *yāndro*, small-village, *yānthamo*, another-village; *ānā tsō*, I will-eat, *ānā tsōlām*, I will-eat-again, *ānā tsōtem*, I will-eat-first, etc.

Significant Sentence-portions ("Phrases") as Words; "Stems" and "Inflection."—Sentence-members are in turn capable of sub-organization into what we may call significant portions. One significant portion may indeed constitute a whole member, e. g. (*the-boy*)—*walks*, but more often thoughts and feelings and our linguistic expression of them are complex, e. g. *the shepherd—strokes + the dog's + back + with-his-hand, the boy—went-away + without-getting + what-he-came-for*. Here *stroke-s, with-his-hand, what-he-*

came-for, etc., are significant sentence-portions within the larger sentence-members. As the speaker comes to regard these portions as *separable* components of the sentence, and unconsciously reshapes his language accordingly, words begin to coincide normally with sentence-portions (inflectional languages), e. g. Gr. ὄρνιθα πέτρᾳ βάλλει, lit., the-bird with-a-stone he-hits; Lat. *dorsum cani manu remulcet pastor*, the-shepherd stroke-s the-dog's back with-his-hand; Eng. *John's ship ran aground* = the-ship of-John did-run on-the-ground.

In this stage of language different particular words associate themselves as "*forms*" under one general word, e. g. *I*, *me*, *we*, *us* are forms of *I*; *am*, *was*, etc., are forms of *be*, etc. *Usually* the different forms of a word come to closely resemble each other (see ANALOGY), and then their common portion comes to be felt as a "*stem*" whose variations are felt as "*inflections*." Stem and inflections may be completely fused (e. g. Arab. *aqtala*, Eng. *men*) or completely analyzable (Gr. ἐ-λύ-θη-ν, I-did-get-released, lit., did-released-get-I), but if detached retain no sentence function.

Sentence-elements as Words; "*Roots*," "*Affixes*."—Sentence-portions having resembling significance (whether different words or forms of the same word) constantly tend to form association groups, and in the end (see ANALOGY) to acquire resembling forms, with constant variations for the expression of like variations in meaning, relation, or function. The constant part then becomes a "*root*" (e. g. *sorr-* in *sorrow* and *sorry*, *str-ng* in *strong* and *strength*).* When the variation in form is not completely fused with the root, it then becomes an *affix* (either *prefix*, *suffix*, or *infix*), e. g. *-y* in *sorry*, etc. As fast as this analysis succeeds in expressing itself in the sentence-structure, roots, or both roots and affixes, become detachable as words. Three stages of development arise: (1) Either the significant root (or stem) alone or the root and affix together constitute a word, but the affix alone does not (agglutinative languages), e. g. Sanskr. *sarva-* or *sarva-s*, all; in Congo *tua-ki-vangidi*, lit., we it made, *vangidi* alone is a word, or *tua-ki-vangidi* is one word, but neither *tua* nor *ki* nor *tuaki* are words; Eng. *home-ward*, etc. (2) Both significant root and relational root are words (analytic languages). (3) Significant, relational, and mechanical roots are all words (isolating or root languages). Examples: *he gives food to you* (all significants and the relational *to* are words, but the mechanical *s* is not); Jap. *tsuki ga hikaru*, the moon shines, *kono kodomo wa yokunakatta*, this boy was not good (all significants and the relationals [nominative particles] *ga* and *wa* are words, but mechanicals *-na-*, not, *-katta*, was, are not words); Eng. *the moon is bright*, *this boy was not good* (all elements words).

"*Cognates*," "*Derivates*"; *Compound Words*.—Words felt as having a common root are called *cognates*. If the root is felt to be practically identical in form with one of a group of cognates, this is regarded as a *primate* (or *primitive*) to which the rest are *derivates* (or *derivatives*). Logically, derivation implies some change or addition to the concept expressed by a word.

Pailful, *church-steeple*, *pickpocket*, *foretell*, *forget-me-not*, etc., are examples of compound words. In English nearly all parts of speech are freely compoundable with each other, as in the examples above (noun + adj., noun + noun, verb + noun, adv. + verb, verb + pron. + adv.). Compounds may be (1) copulative, with both members on an equal footing, e. g. *The* THOMPSON-HOUSTON *Co.*; (2) determinative, with one (in Eng. the former) member serving as a modifier of the other, e. g. *wind-mill*, *ill-gotten*; (3) secondary adjective, e. g. *a* THREE-FOOT *rule*, UPHILL *work*, etc. As a rule, logical derivation (see above) and fusion of meaning subsists between the members of a compound, but this makes them one word only as it makes them fill the place of one word in sentence-structure. With exactly the same juxtaposition and fusion (or lack of fusion) of meaning, groups that must be compounds in one language can not be so in another, e. g. Sanskrit copulatives would not be compounds in an uninflectional language; Germ. *steinbrücke* is a compound, but Eng. *stone bridge* is not, because *stein* by itself can not suggest adjective function, but *stone* can; Chin. *min li* = Gr. δημοκρατία, lit., people-power, but the former is not a compound, because *min* alone suggests adjective function.

ROBERT J. KELLOGG.

Worde, wawrd, WYNKIN, de: printer; b. probably at Worth, Belgium, about 1455; was an assistant to Caxton in his first English press at Westminster, and after his master's death (1491) succeeded to the business; made many improvements in the art; introduced Roman letters and many fonts of different sizes, which he sold to other printers; was the first to adopt title-pages and to employ Greek characters; enjoyed the patronage of the Queen-dowager Margaret, and was an intimate friend of Richard Pynson. He had printed 408 works, many of them being school-books; all remarkable for neatness and elegance. The best specimens of his press are Higden's *Polycronicon* (1495) and Stephen Hawes's *Pastime of Pleasure* (1517). D. after 1535.

Worden, JOHN LORIMER: rear-admiral U. S. navy; b. in Westchester co., N. Y., Mar. 12, 1818; entered the navy as midshipman Jan. 10, 1834; commanded the Monitor in her famous fight with the Merrimack Mar. 9, 1862, and the Montauk in the attacks on Fort McAllister of Jan. 27 and Feb. 1, 1863, and in the first Fort Sumter fight of Apr. 7, 1863. By his heroic conduct in the engagement with the Merrimack, Worden gained a worldwide reputation. Toward the close of that action a shell, exploding against the pilot-house of the Monitor, fractured one of the great iron logs of which it was composed, and filled his eyes with powder, so that for a long time he was blind. He was promoted captain Feb. 3, 1863; was on duty at New York connected with the iron-clads 1863–66; commanded the Pensacola in the Pacific squadron 1866–67; was promoted to the rank of commodore May 27, 1868; superintendent of the Naval Academy 1870–74; commissioned rear-admiral Nov. 20, 1872; commander-in-chief of the European squadron Feb. 3, 1875, to Dec. 23, 1877; member of the examining board and president of the retiring board; retired Dec. 23, 1886. D. Oct. 18, 1897.

Wordsworth, CHARLES, D.C.L.: bishop; son of Rev. Dr. Christopher Wordsworth (1774–1846); b. at Bocking, Essex, England, Aug. 22, 1806; educated at Harrow School and at Christ Church, Oxford; took his degree 1830, gaining a studentship and two chancellor's medals; took orders in the Church of England; was a tutor at Cambridge 1830–33, having among his pupils W. E. Gladstone and Cardinal Manning; was second master of Winchester College 1835–46, and first warden of Trinity College, Glenalmond, Perthshire, Scotland, 1846–54; contributed largely to the establishment of that institution on a firm basis, and built the college chapel (costing £8,800) at his own expense; became bishop of the united dioceses of St. Andrews, Dunkeld, and Dunblane 1853; distinguished himself by his efforts to procure "a united Church for the United Kingdom," and by his vindications of the Anglican doctrines, and was one of the "New Testament Company for the revision of the authorized version of the Bible." D. in London, Dec. 5, 1892. He was the author of numerous theological and critical treatises, including *Shakespeare's Knowledge and Use of the Bible* (London, 1864; 3d ed. 1880), and of a Greek grammar in extensive use, *Græcæ Grammaticæ Rudimenta* (1839; 19th ed. 1868). See his autobiography to 1856, *Annals* (2 vols., 1891–93; vol. iii. promised). Revised by S. M. JACKSON.

Wordsworth, CHRISTOPHER, D. D.: clergyman and author; youngest brother of William Wordsworth; b. at Cockermouth, Cumberland, England, June 9, 1774; studied with his brother at Hawkeshead School, Lancashire, also at Trinity College, Cambridge; took his degree 1796; was elected a fellow of Trinity 1798; took orders in the Church of England; became chaplain to the Bishop of Norwich, subsequently Archbishop of Canterbury, 1802; rector of Ashby, Norfolk, 1804; dean of Bocking, Essex, 1808; rector of St. Mary's, Lambeth, and of Sundridge, Kent, 1815; exchanged the two last-named livings for the rectory of Buxted, Sussex, 1820; was master of Trinity College, Cambridge, 1820–41; and was instrumental in adding the new quadrangle or "court" to that famous seat of learning. D. at Buxted, Feb. 2, 1846. He was the author of *Ecclesiastical Biography* (London, 6 vols., 1810; 4th ed. 4 vols., 1853); *Who Wrote Eikon Basilikè?* (1824–25, 2 parts), maintaining the authenticity of that work; *King Charles I. the Author of Icon Basilike further Proved* (Cambridge, 1828); and *Christian Institutes, selected from the Writings of the Most Eminent Divines of the English Church* (4 vols., London 1837). Revised by S. M. JACKSON.

Wordsworth, CHRISTOPHER, D. D.: Bishop of Lincoln; son of Christopher Wordsworth and nephew of the poet; b. at Bocking, Essex, England, Oct. 30, 1807; educated at Trinity College, Cambridge; graduated 1830, having twice gained the chancellor's medal for English poems, and having also taken the Browne medals (1828) for the best Latin ode and

* *Root* is used here to include the narrower term *stem*.

Greek epigram; became a fellow 1830; took orders in the Church of England 1833; traveled in Greece 1832–33; prepared *Athens and Attica* (London, 1836; 4th ed. 1869), *Inscriptiones Pompeianæ* (1837), and *Greece* (1839; 4th ed. 1867); was head master of Harrow School from Apr., 1836, until Nov., 1844, when he was made canon of Westminster Abbey by Sir Robert Peel; became vicar of Stanford-in-the-Vale, Berkshire, and rural dean 1850; archdeacon of Westminster 1865; was consecrated Bishop of Lincoln Feb. 24, 1869, and took part in the "Old Catholic" congress at Cologne Sept., 1872. D. at Lincoln, Mar. 20, 1885. Among his works are *Theophilus Anglicanus* (1843; later ed. under the title *Elements of Instruction concerning the Church, and the Anglican Branch of it.* 10th ed. 1879); *A Diary in France mainly on Topics concerning Education and the Church* (1845); *On the Canon of the Scriptures of the Old and New Testaments and on the Apocrypha* (1848; 6th ed. 1867); and *Lectures on the Apocalypse* (1849; 3d ed. 1852), being the Hulsean lectures for 1847 and 1848 respectively; *Memoirs of William Wordsworth* (2 vols., 1851); *St. Hippolytus and the Church of Rome* (1853; 2d ed. 1880); *The Inspiration of the Bible* (1861; 8th ed. 1875); a volume of hymns, *The Holy Year* (1862; 5th ed. 1868); and *A Journal of a Tour in Italy* (2 vols., 1863); edited *The Correspondence of Richard Bentley* (2 vols., 1842), the works of *Theocritus* (1844), the Greek text of the *Apocalypse* (1849) and of the *New Testament* (4 parts, 1856–60; 2d ed. 1872—his chief work), and *The Holy Bible, with Notes and Introductions* (5 vols., 1864–70), and was a prominent contributor to Smith's *Dictionary of the Bible.* See his *Life*, by J. H. Overton and E. Wordsworth (1888). Revised by S. M. Jackson.

Wordsworth, John: See the Appendix.

Wordsworth, William: poet; b. at Cockermouth, Cumberland, England, Apr. 7, 1770; the second son of John Wordsworth, attorney-at-law, and his wife Anne Cookson of Penrith. His mother died in 1778 and his father in 1783, leaving William and his brothers ill provided for. John Wordsworth had been agent to the Earl of Lonsdale, who borrowed all his fortune and refused to repay it. The future poet was brought up by his maternal grandparents at Penrith, and went to school at Hawshead. In Oct., 1787, he proceeded as an undergraduate to St. John's College, Cambridge. In his second vacation he and his friend Jones took the "unprecedented course" of taking a walking-tour in Switzerland, an experience long afterward described in *The Prelude.* Wordsworth took his B. A. degree in Jan., 1791, and left Cambridge; later in the same year he paid a visit of more than a year to France. With very limited resources, and still uncertain of his genius, Wordsworth lingered in England without a profession. At length, toward the end of 1794, he was relieved from the absolute necessity of working by a legacy from a young friend, Raisley Calvert. In 1795 his admirable sister joined him, and they settled at Racedown, in Dorset. His earliest publications, *The Evening Walk* and *Descriptive Sketches*, written in the old-fashioned style of the preceding century, had appeared in 1792; he was now determined to be a poet, but his style came to him slowly. Coleridge became his friend in 1797, and in July of that year the Wordsworths removed to Alfoxden, in Somersetshire, to be near Coleridge at Nether Stoway. Here the greater part of the *Lyrical Ballads*, published at Bristol in 1798, was composed. On the appearance of this volume the Wordsworths immediately left for Germany, and spent the winter at Goslar. Here Wordsworth wrote some of the finest and most characteristic of his poems, and here *The Prelude* was planned and begun. Returning to England in the spring of 1799, the poet and his sister determined to settle in their own ancestral country, whose lakes and mountains had left an indelible stamp on the whole surface of Wordsworth's imagination. He settled in a cottage at Townend, Grasmere, "the lovely cottage in the guardian nook." From this time forward the life of Wordsworth, although to be prolonged for more than half a century, was to be almost without external incident. In 1800 he issued a new edition of the *Lyrical Ballads*, with a second volume of unpublished and maturer poems. In 1802 he married Miss Mary Hutchinson, of Penrith, a lady of refined character and devoted amiability. His tours now take importance in his career because they stimulated him to direct poetic production. In 1802 the Wordsworths went to France, in 1803 to Scotland; the *Diary* of Miss Wordsworth on the latter occasion is a valuable document which was first published three-quarters of a century later. In 1803 Wordsworth formed the acquaintance of Sir George Beaumont, the painter, who was visiting Coleridge at Greta Hall. The baronet, who lived till 1827, became one of Wordsworth's few intimate friends. Beaumont presented to him a piece of land at Applethwaite, near Keswick, hoping to persuade him to move there, but the poet clung to Grasmere. On the birth of his fourth child in 1808, Wordsworth left his cottage and moved to Allan Bank, and then, in 1811, to the parsonage of Grasmere, where he lived for two years. In the spring of 1813 Lord Lonsdale appointed the poet distributor of stamps for the county of Westmoreland, and Wordsworth moved into the more commodious residence of Rydal Mount, near Ambleside. A more lucrative local post he afterward declined. The remainder of his life was spent at this house of Rydal. In 1814 Wordsworth published the long and elaborate poem of *The Excursion*, in which his poetical philosophy was for the first time put strenuously before the public. This didactic epic was received at first with scant respect, and even with open ridicule, but it soon became accepted as one of the masterpieces of English poetry. In 1815 appeared a collection of Wordsworth's lyrical poems, arranged upon a new plan, and in two essays, prefixed and appended to this volume, he developed his theory of poetic art. A second tour had been taken in Scotland in 1814, and had, as usual, stimulated the poet to write. But his finest gift, that of solemn and penetrative melody, was now about to leave him for ever, and after 1820, if not after 1816, he can scarcely be held to have added to what is exquisite in English literature, although he continued to be earnest, forcible, and sometimes stately in his verse. In 1815 he published the romantic narrative of *The White Doe of Rylestone*; in 1819 *Peter Bell* and *The Waggoner*, two juvenile studies in somewhat affected excess of simplicity; in 1820 the series of sonnets entitled *The River Duddon*; in 1822 a first draft of those *Ecclesiastical Sonnets* which long entertained his middle life; in 1835 a rather barren volume named *Yarrow Revisited.* In 1842 he rearranged his *Poems chiefly of Early and Later Years.* The serenity of his life was troubled in 1832 by his sister's mental decay, and in 1834 by the death of Coleridge. But he was now enjoying a tardy celebrity; the University of Oxford conferred upon him in 1839 the degree of D. C. L., in 1842 he received a pension of £300 a year from the civil list, and in Mar., 1843, succeeded Southey as poet-laureate. His only remaining work of importance was the *Two Letters*, on the railway projected between Kendal and Windermere, against which scheme he eloquently protested in 1844. In 1847 he lost his favorite daughter, Dora Quillinan. Wordsworth died of pleurisy, at Rydal Mount, Apr. 23, 1850, and was buried among the dalesmen in Grasmere churchyard. His great poem *The Prelude* was published posthumously in 1850, and *The Recluse* not till 1888. *A Life of Wordsworth*, by Dr. Christopher Wordsworth, in 2 vols., was issued in 1851, and a new edition of his poems, in 6 vols., in 1865. In 1876 the Rev. A. B. Grosart published the prose works, in 3 vols. Mr. F. W. H. Myers's sympathetic memoir dates from 1881. In 1882 Prof. W. Knight began to issue an elaborate edition of the poetical works, of which the eighth and last volume appeared in 1886. Edmund Gosse.

Work [O. Eng. *weorc*, *worc*: O. H. Germ. *werc* (> Mod. Germ. *werk*): Icel. *verk*: Goth. *gawaúrki*; Gr. ἔργον, work]: a term used in mechanics to express the effect produced by a force in causing a definite change of position of a body. In the case of gravity the work done is estimated by the product of the weight of a body and the vertical distance moved through by its center of gravity—that is, if W is the weight and h the vertical distance, the work done is Wh. Hence it appears that the work done depends upon the initial and final positions only. For instance, the work done in raising a body through a vertical height is the same as that expended in drawing the body up an inclined plane of the same height, provided the effect of friction is neglected.

In general, the work done by a force P is expressed by $\int P \cos \theta ds$, where θ is the angle between the force and the infinitesimal line (of length ds) along which the point of application moves. Hence if X, Y, Z are the components of P parallel to rectangular axes, since we have

$$P \cos \theta = X\frac{dx}{ds} + Y\frac{dy}{ds} + Z\frac{dz}{ds},$$

we get the work done equal to

$$\int (Xdx + Ydy + Zdz).$$

See Energy, Heat, and Potential. R. A. R.

WO

Showing Princip
Steamship
Continent

Longitude from Greenwich
West 0 East
Lockwood I.
Discovery Harbor
Lady Franklin B.
Grinnell Land
Humboldt Glacier
C. Sabine
Smith Sd.
Jones Sd.
N. Devon
Lancaster Sd.
Wolstenholm Sd.
Murchison Str.
Melville B.
Kaiser Wilhelm Land
C. Bismarck
GREENLAND
BAFFIN BAY
Upernavik
Disco
Godhavn
Home B.
C. Brewster
Godhaab
Frederikshaab
Davis Strait
Frobisher B.
HUDSON BAY
C. Farewell
Labrador
Jan Mayen
North Cape
SPITZBERGEN
Gillis L.
Franz Joseph Land
ARCTIC OCEAN
NOVA ZEMBLA
KARA SEA
Karski Str.
Kola
Lapland
Arctic Circle
Iceland
Reikiavik
Mt. Hecla
Faroe Ids.
Shetland Ids.
Orkney Ids.
Hebrides
Trondhjem
Bergen
Christiania
Stockholm
Gottenburg
Finland
Archangel
Poustozersk
Obdorsk
Berezov
R. Obi
Tornea
Cronstadt
St. Petersburg
RUSSIA
Riga
Nizhnee Novgorod
Kasan
Yekaterinbourg
Tobolsk
Omsk
Orenburg
Moscow
Saratov
Volga R.
Kiev
Odessa
Astrachan
Stavropol
Aral S.
Khiva
Khokan
Caspian S.
Black Sea
Constantinople
Smyrna
GREECE
TURKEY
Bokhara
TURKESTAN
Yarkand
Teheran
PERSIA
Herat
AFGHANISTAN
Ispahan
Bushire
Lahore
Delhi
BALUCHISTAN
Medina
Mecca
Muscat
Bombay
ARABIAN SEA
Goa
Socotra
Suez to Colombo
Colombo
Equator
Seychelles Ids.
Farquhar Ids.
Rodriguez
Mauritius or I. of Fr.
Reunion or Bourbon I.
Madagascar
Tamatave
Tananarivo
Mozambique Channel
Zanzibar
Quiloa
Mombaz
Aden
Berbera
Magadoxo
Suakim
Mocha
Kartoon
Nile R.
Red Sea
EGYPT
Cairo
Suez
Port Said
Alexandria
Tripoli
Tunis
Algiers
Fez
Morocco
Madeira I.
Canary Ids.
Azores
Lisbon
PORTUGAL
SPAIN
Madrid
C. Finisterre
C. St. Vincent
Str. of Gibraltar
Mediterranean S.
Marseilles
Genoa
Rome
Naples
Bordeaux
Paris
FRANCE
Brest
Dublin
Valentia B.
Queenstown
Liverpool
Glasgow
Edinburgh
SCOTLAND
IRELAND
ENGLAND
London
Hamburg
Bremen
Berlin
Cologne
Vienna
AUSTRIA
Triest
Copenhagen
Cuxhaven
Kiel
Stettin
Danzig
Riga
Reval
Helsingfors
Tornea
Wisby
Gotland
Stockholm
Christiania
Bergen
Hamburg to Aspinwall
Moorzook
Sahara or Great Desert
Tropic of Cancer
C. Blanco
Timbuctoo
Agades
Bilma
Sudan
Niger R.
Liberia
Freetown
Monrovia
C. Palmas
Guinea
G. of Guinea
Lower Guinea
CONGO FREE STATE
Loango
Congo R.
Loanda
Benguela
Mossamedes
Sesheke
Quilimane
Zambesi R.
Sofala
Inhambane
Delagoa Bay
Manambaine
Walfisch B.
Orange R.
Cape Colony
Port Natal
Algoa B.
C. of Good Hope
Cape Town
Tristan da Cunha
Gough's I.
Amsterdam
St. Paul I.
Pr. Edward I.
Marion I.
Crozet I.
Possession I.
Kerguelen Land
McDonald I.
Bouvet Ids.
Sandwich Land
S. Georgia I.
ANTARCTIC OCEAN
Falkland Ids.
Terra del Fuego
Magellan Str.
C. Horn
S. Orkney Ids.
S. Shetland Ids.
Graham Land
Enderby I.
Kemp I.
Tropic of Capricorn
Rio de Janeiro
Trinidad
Victoria
C. Frio
Rio Grande do Sul
Montevideo
Rio de la Plata
Buenos Ayres
Rosario
Santa Fe
Valparaiso
Juan Fernandez
Copiapo
Cobija
Arica
Iquique
Chuquisaca
Chincha Ids.
Callao
Lima
La Paz
Lobos Ids.
C. Parina
Guayaquil
Quito
ECUADOR
Bogota
COLOMBIA
Caracas
Venezuela
Orinoco R.
Georgetown (Demarara)
Paramaribo
Cayenne
GUIANA
Panama
Aspinwall
Jamaica
Cuba
Havana
Progreso
Campeche
Belize
Gulf of Mexico
Caribbean Sea
West Indies
Bermuda Ids.
Charleston
Savannah
Atlanta
Mobile
Galveston
Orleans
Memphis
Chicago
Detroit
Toronto
Montreal
Quebec
Ottawa
Boston
Philadelphia
Washington
C. Hatteras
Halifax
St. Johns
Newfoundland
Portland
Cable 1873
1860
1863
1866
1858 abandoned
1870
Direct U.S.
French Cable 1869
French Cable 1879
New York to Liverpool
Para
Pernambuco
Fernando de Noronha I.
C. St. Roque
Ascension
St. Helena I.
Bahia
Matto Grosso
Chaco
Patagonia
Asuncion
PARAGUAY
ARGENTINE REPUBLIC
CHILI
Tropic of Capricorn
SOUTH AMERICA
SOUTH ATLANTIC OCEAN
SOUTH INDIAN OCEAN
NORTH ATLANTIC OCEAN
NORTH PACIFIC OCEAN
Telegraph Lines.
Routes and
Railroads

Workhouse: See PAUPERISM.

Workington: town; county of Cumberland, England; on the Derwent, near its mouth; 7 miles N. of Whitehaven (see map of England, ref. 4–E). It has a good harbor lined with convenient quays, furnished with a breakwater, and provided with docks. Breweries, distilleries, and factories for the manufacture of sailcloth, cordage, and chemicals are in operation, and large quantities of coal from the rich collieries of the vicinity are exported. A Sheffield steel-foundry was transferred here in 1883. Pop. (1891) 23,522.

Worksop: town; county of Nottingham, England; on the Ryton; 16 miles E. S. E. of Sheffield (see map of England, ref. 7–I). Malting, brass and iron founding, and manufactures of agricultural implements are carried on. Pop. (1891) 12,734.

World: the earth from the standpoint of habitability and other material human interests. To the part of the earth habitable by man the Germans have given the name of *Oekonom*. Judging of what is habitable by what is and has been inhabited, this area may be defined as follows: In the Antarctic the entire continent and the adjoining islands are excluded. In the Arctic regions the boundary is irregular. It includes all Norway and Siberia, including Nova Zembla and the New Siberian Archipelago, but not Wrangel island. In North America it includes all the continent, but excludes the most of the American Arctic Archipelago. It has its greatest extension N. on Smith Sound (lat. 80° N.). It includes the entire western coast of Greenland S. of this point, but on the east coast does not reach so high N. by several degrees of latitude. Southern Spitzbergen has been occasionally occupied by Europeans throughout the winter, and the southern part of this archipelago should probably be included in the habitable area. Besides the polar caps the districts absolutely excluded are small and unimportant, consisting of limited areas on high mountains. Several large cities are at elevations of about 7,000 feet above sea-level. Quito is at 9,250 feet, Leadville at 10,200 feet, and Lassa at 11,580 feet. Many hamlets and isolated dwellings are at higher elevations, especially in Central Asia and on the Andes. With toleration created by habit, life can be comfortably supported at 14,000 feet elevation, but at 20,000 feet it is supported with difficulty, and at 4 miles may be set the limit of habitability in altitude.

The habitable parts of the earth's surface have very varied capacity for supporting life. In the worst of the deserts it is almost, though probably never quite, *nil*. On rich alluvial plains, especially in temperate regions because of their freedom from malarial disease, this capacity reaches its maximum, the average per square mile in Belgium being 550 (1893), in the province of Shantung, China, 557 (official estimate 1882), and for Rampur, a small protected native state in Northern British India, 561 (1891). The average density of population for the entire British possessions throughout the world is thirty-five per square mile, and this is probably a fair average for the entire habitable land area, although its extreme capacity is probably five to ten times as great. This capacity has been greatly increased in the nineteenth century by the advance in civilization. The mastery of steam and electricity accomplished in this time by civilized man has added so greatly to his powers as to make of him almost a new species, and has increased manifold his power to wring his sustenance from nature. It has also powerfully protected him from the agents of destruction, as, for instance, preventing famines by speedy and effective interchange of foods.

One of the most noteworthy and one of the most recent features of man's conquest of the world is seen in the manner in which he has bound it together into one organic whole. Such is the effect of the extraordinary growth of the postal system since 1870. Similar in effect is the system of maritime exchanges now so general and so enormous in volume that a failure of crops in any country is felt throughout the markets of the world. An even better illustration is found in the system of submarine cables. (See map herewith.) The telegraph proved effective by Morse in 1844, and soon covering with a network of wires the land area of the civilized world, was in 1866 extended by Field under the Atlantic Ocean, connecting Europe and America. Since that time these threads of copper, rubber, and steel have bound together the severed masses of land in all directions so effectively that an event in Australia at noon can be read in the New York newspapers at the breakfast table of the same day.

The geographic conquest of the habitable world is nearly complete. The commercial conquest goes hand in hand with the geographic. Eventually must come the economic conquest—that is, the conquest of the earth's surface as a source of sustenance, the utilization of its agricultural and piscicultural capacity to its limit. This is not of such pressing and immediate importance. Congestion of population can yet be at once relieved by emigration, but the economic conquest may be the most important problem a century hence. See also EARTH, GEOLOGY, CLIMATE, etc.

MARK W. HARRINGTON.

World's Columbian Exposition: See COLUMBIAN EXPOSITION, WORLD'S.

Worms, or **Vermes** [O. Eng. *wyrm* : Germ. *wurm* : Goth. *waúrms*; cf. Lat. *vermis*, Gr. *ῥόμος*, wood-worm]: a division of the animal kingdom, including a varied assortment of forms without many features in common. As a rule, they have elongate, cylindrical, or flattened bodies, and are without appendages. The present tendency is to restrict the group by removing from it the PLATHELMINTHES, TUNICATA, and ENTEROPNEUSTA (*qq. v.*), and as thus limited they may be defined as having, with few exceptions, bilaterally symmetrical bodies, with a digestive tract with two openings (mouth and anus) and a circulatory (blood-vascular) system. A body-cavity (cœlom) is usually present, and the nervous system, variously developed, always has a principal center (brain) above the throat. Excretory organs (nephridia) are usually present, and serve to carry waste products from the cœlom or from the tissues generally to the exterior. The branch *Vermes* is usually divided into the following classes: *Nemertines*, *Nemathelminthes*, *Annelida*, *Rotifera*, *Chætognatha*, and *Prosopygii*, to which reference should be made for further details. See also PALEONTOLOGY. J. S. K.

Worms, Germ. pron. *vōrms*: town of Hesse-Darmstadt, on the Rhine; 20 miles N. W. of Heidelberg (see map of German Empire, ref. 6–D). It is one of the oldest cities of Germany. It existed before the time of the Romans, was the residence of Charlemagne, and the seat of the famous diet before which Luther was summoned in 1521. In 1689 it was taken and sacked by the French, and only the cathedral (see illustration in ARCHITECTURE), a fine structure, built 996–1016, of red sandstone in Byzantine style, and a few houses, escaped destruction. It was soon rebuilt, but it never recovered its former prosperity. It manufactures leather, tobacco, and soap, and in its vicinity is produced the celebrated Rhenish wine called *Liebfrauenmilch*. (For the Concordat of Worms, see CONCORDAT.) Pop. (1895) 28,629.

Wormseed: the name given in the U. S. to the fruit of *Chenopodium ambrosioides*, a wild herbaceous plant, native in the U. S., and most commonly met with in the Southern States. The plant possesses a peculiar aromatic but disagreeable smell. Wormseed is found in commerce in the form of very minute grains, which have the characteristic odor of the plant. When distilled, they yield a volative oil (*oleum chenopodii*). In Europe the term wormseed (*Semen cinæ*, *Semen santonici*, *Semen-contra*) is given to the small unexpanded flowers of *Artemisia vahliana*, *A. sieberi*, and *A. inculta*. The first (Levant wormseed) is indigenous in Persia and Asia Minor; the second (African or Barbary wormseed) is found in Persia, Barbary, and Arabia; the third is said to furnish the East Indian wormseed. These varieties contain a volatile oil, an active principle (santonin or santonic acid; see SANTONIN), resin, with extractive matters, and other ordinary constituents of plants. The oil is prepared by distilling wormseed with water, and forms a yellow or brownish-yellow liquid, possessing the peculiar disagreeable odor and aromatic burning taste of the plant. Wormseed is employed in medicine as a vermifuge, but lately santonin has been generally used in its place. In the U. S. the seeds and oil of *Chenopodium ambrosioides* are most generally employed as an anthelmintic remedy.

Revised by H. A. HARE.

Wormwood [corrupted under influence of *wood* from M. Eng. *wermode* < O. Eng. *wermōd* : Germ. *wermuth*, whence the Fr. has *vermout*]: the leaves and flower-tops of the *Artemisia absinthium*, a perennial plant indigenous in Europe, but naturalized in the U. S. It possesses a strong, peculiar odor and a very bitter unpleasant taste, which are imparted to its aqueous and alcoholic infusions. The dried plant furnishes by distillation a dark-greenish oil (*oleum absinthii*, $C_{10}H_{16}O$), which is isomeric with ordinary camphor,

has a specific gravity of 0·932, and possesses the odor and taste of the plant. The bitter principle of wormwood (*absinthin*, $C_{20}H_{28}O_4$) forms a yellow, pulverulent mass, is neutral to test-papers, and has the odor and taste of wormwood. The remaining constituents of wormwood are chlorophyll, albumen, fibrin, lignin, starch, and saline matters. It is occasionally employed externally in medicine as an antiseptic and discutient, and was formerly used also as a tonic. The volatile oil of wormwood, upon which its active qualities depend, possesses narcotic properties, and if given in large dose produces epileptiform convulsions, and even death; when mixed with oil of anise, fennel, etc., and dissolved in alcohol, it forms the well-known *liqueur* ABSINTHE (*q. v.*). Revised by H. A. HARE.

Wornum, RALPH NICHOLSON: writer on fine art; b. at Thornton, Northumberland, England, Dec. 29, 1812; educated at University College, London; became a portrait-painter in London; became lecturer on art to the Government schools of design 1848; librarian to those schools 1852, and keeper and secretary of the National Gallery 1855; author of *A Sketch of the History of Painting* (1846; 4th ed. 1861); *Analysis of Ornament* (1856); *The Epochs of Painting, a Biographical and Critical Essay on Painting and Painters of All Times* (1864); and a *Life of Holbein* (1867); edited the *Lectures on Painting* by the Royal Academicians Barry, Fuseli, and Opie (1848). D. at Hampstead, Sept. 15, 1877.

Worsaae, *vor'saw*, JENS JACOB ASMUSSEN: archæologist; b. at Veile, Jutland, Denmark, Mar. 14, 1821; studied theology and law at Copenhagen, Scandinavian history and archæology; traveled in Great Britain and Ireland, France, Germany, and Italy, and was appointed Professor of Northern Archæology at the University of Copenhagen in 1854; director of the Museum of National Antiquities in 1861; and Minister of Public Education 1874–75. His principal works are *Danmarks Oldtid* (Copenhagen, 1843; translated into English by W. J. Thoms as *The Primeval Antiquities of Denmark*, 1849); *Minder om de Danske og Nordmändene i England, Skotland og Irland* (1851; translated into English as *An Account of the Danes and Norwegians in England, Scotland, and Ireland* (1852); *Den Danske Erobring af England og Normandiet* (1863); *Om Danmarks tidligste Bebyggelse* (Concerning the Earliest Settlement of Denmark (1861); *Nordens Forhistorie* (The Primitive History of the North, 1881) etc. One work is translated into French—*La Colonisation de la Russie et du Nord Scandinave, etc.* (1875). D. at Holbäk, Zealand, Aug. 15, 1885. Revised by D. K. DODGE.

Worship [M. Eng. *worschipe, wurðscipe* < O. Eng. *weorðscipe*, honorableness, honor; *weorð*, worth, honor + *-scipe*, -ship]: the chief act of religion, and its natural expression. It is performed in various ways, from fetishism, the lowest form of human worship (see FETISH), to the highest adoration of him who is the Supreme Spirit.

The *objects* of worship are God, angels, spirits of ancestors, saints, powers and objects of nature such as the sun, moon, and stars, relics, pictures, idols, etc. Of the natural objects the sun enjoyed the greatest favor. The worship of Apollo, so popular among the Greeks, was really sun-worship. Among the Phœnicians the sun was the center of their cultus, so with the Sabæans; so with the Incas in Peru; and with many other tribes more or less advanced in civilization. The Schoolmen emphasized the distinction between *latria* (service), rendered only to God, and *idolatria*, rendered to images. (See IDOLATRY.) Later distinctions have been added—viz., *dulia*, to saints and angels—*hyperdulia*, to the Virgin Mary.

Every pagan worship centers in sacrifices. (See PAGANISM.) They are offered to propitiate the divine favor and under a sense of guilt, or in thanksgiving, or to secure mercy and favor, or sometimes to serve as food or drink for the gods. Human sacrifices are offered under the notion that the most precious gift will buy the largest favor. As fire is deemed purifying, mysterious, and sacred, the highest sacrifice is by burning. Similarly, in the Old Testament, sacrifice appears at first as an expression of faith in a present God, as an act of propitiation and thanksgiving, and a pledge of a covenant. Blood is the life; therefore the best sacrifices are bloody. The offerings were of "clean" domestic animals, grain, fruits, wine, oil, etc., offered on altars of stone and earth or metal, in sacred places, under trees, groves, on "high-places"; later in the tabernacle and the temple. Sacred times were sabbaths, new moons, the feasts of the Passover, Pentecost, Atonement, Tabernacles, Trumpets, Jubilee, Dedication, and Purim. (See FEAST.) In the completed temple-service to sacrifice were added prayer, praise, instrumental and vocal music, instruction, purification; also circumcision, vows, tithes, etc. The synagogue-service, in which prayer took the place of the sacrifices of the temple, consisted of (1) prayer, with written forms; (2) reading of Scripture in three parts—(*a*) Shema (three extracts from Numbers and Deuteronomy); (*b*) the Law; (*c*) Prophets; (3) expounding the Scriptures. Services were held Saturday, Monday, and Thursday, morning, noon, and evening, and were conducted by the "elders," ministers or "angels," and deacons. See SYNAGOGUE.

The early Christians organized their services on the synagogue model. They met in private houses, or solitary places, or hired halls at any convenient and safe time. No stress was laid at first on a particular order. They read from the Old Testament, explaining the passage in free discourse, in which at first all could join. They listened to the exhortation of some eye-witness of the Gospel history, or to some letter written by an apostle. Individual gifts were used under the promptings of the Spirit, according to mutual regard and utility. Singing and prayer followed. Then the love-feast (see AGAPÆ) and the covenant supper were solemnized, the kiss of fraternal love was given, and the voluntary offerings were made. By the end of the second century the service was divided into the *missa catechumenorum*, called "Scripture reading"—in which were psalmody, Scripture lessons, the sermon, and some of the prayers—and the *missa fidelium*, called "prayers." In the latter the prayers, which were all offered at the altar, were for consecration, for the whole Church, for the peace of the world, and all orders of men. There were also the Eucharist, hymns, thanksgivings, and doxologies. (See MASS.) By the third century Christian temples were frequent, and sometimes splendid. They were divided into the porch, nave—where the pulpit stood—and the sacristy. (See CHURCH.) In the fourth century triumphant Christianity built magnificent churches or appropriated public buildings (see BASILICA), and adorned its clergy with peculiar costumes, kindled lights on the altars, used incense, and gave more attention to artistic music and responses. The agape was separated from the Lord's Supper and became a feast. With the union of Church and state the liturgical tendencies were rapidly developed, forms were multiplied, and the ministers came to be held as a peculiar class. See CLERGY.

The public worship of the Church includes—(1) Prayer (see PRAYER), in the vernacular or some sacred though often unfamiliar tongue, written and formal or unstudied, standing or kneeling, rarely prostrate, with uncovered heads, with or without responses. (2) Reading of Scripture. (3) Preaching, exposition, exhortation, etc. (4) Singing, in the words of Scripture or human compositions, with or without instrumental accompaniment, by the congregation, or later by choirs. (See HYMNOLOGY.) "Hymns are prayers in the festive dress of poetry," tendered with music on account of the strong influence it exerts on the emotions. (5) Confession of faith. (6) Voluntary offerings; and (7) sacraments, which universally are two in number, baptism, the initiatory rite, and the Lord's Supper, the rite of witnessing and edification. The latter was celebrated every day, or every Lord's Day, or at longer intervals. In the Greek and Roman Catholic Churches five sacraments are added to them, but they form no proper part of worship. (See SACRAMENT.) Christian worship is held on the Lord's Day, or on daily or on yearly festivals or fasts which commemorate special events.

The liturgical class emphasize the sacrificial side of worship—others, especially the Reformed churches, the didactic side. A multiplicity of ceremonies is commended, on the ground that they give expression to varied sentiments—that they enliven and increase devotion and piety by moving the senses, and lead the illiterate more easily to a knowledge of the mysteries of religion. It is condemned on the ground that it diverts the attention from the simple principles of worship, and that, as worship is a divine ordinance, nothing is to be allowed except that which is divinely ordained.

Worship implies the ascription of divine perfections to its object, the possession of such perfections giving the only claim for such homage. In the fourth century the worship of saints was developed from the veneration of martyrs. The worship of the Virgin Mary has gradually greatly increased from early days until it forms the distinctive feature

of the modern Roman Catholic Church. The use of images (i. e. statues and pictures) was allowed by the Council of Nice (787), and the adoration of relics by the Council of Trent (1545). See the article IMAGE-WORSHIP.

Revised by S. M. JACKSON.

Worsley, PHILIP STANHOPE: poet and translator; b. in Kent, England, about 1832; educated at Cholmeley School, Highgate, and at Corpus Christi College, Oxford, where he was elected scholar 1854, and subsequently fellow; took orders in the Church of England; gained the Newdigate prize for his poem, *The Temple of Janus* (1857); contributed poems to *Blackwood*; published a volume of *Poems and Translations* (1863); *The Odyssey of Homer, translated into English Verse in the Gregorian Stanza* (Edinburgh, 2 vols., 1861–62); and *The Iliad of Homer, translated into English Verse in the Spenserian Stanza* (vol. i., 1865), both of which have taken a high place among the versions of Homer. D. at Freshwater Bay, Isle of Wight, May 8, 1866.

Revised by H. A. BEERS.

Worsted: See WOOL AND WOOLEN MANUFACTURES.

Wörth, *vört*: village of Alsace, with 1,014 inhabitants in 1890; at the junction of the Sulzbach and the Sauerbach (see map of France, ref. 3–I). It is noted as the point where the first decisive encounter took place between the French and German armies Aug. 6, 1870. The principal point in the French position was Frösehweiler, a village on the road between Wörth and Reichshofen. See FRANCO-GERMAN WAR.

Worth, WILLIAM JENKINS: soldier; b. at Hudson, N. Y., Mar. 1, 1794; fought in the war of 1812, and rose to the rank of captain in 1815. Appointed colonel of the Eighth Infantry July, 1838, he commanded the northern department during the insurrectionary movement on the Canada border 1838–39. In 1840 he was ordered to Florida, and in 1841 placed in command of the army there. During this and the next year the hostile Seminoles were subdued, and the greater part of them removed to the Indian Territory. For gallantry and highly distinguished services in Florida he was breveted brigadier-general Mar. 1, 1842, and retained in command of the department of Florida until 1846, when again called to the field by the outbreak of the war with Mexico. In the battle of Monterey his command stormed the heights commanding the Bishop's Palace, and carried the palace itself. He further distinguished himself at Cerro Gordo, Churubusco, Molino del Rey, Chapultepec, and in the storming of the city of Mexico. For his services at Monterey, Congress presented him with a sword of honor, and similar testimonials were bestowed upon him by his native State and county, and by the State of Louisiana. D. at San Antonio, Tex., May 7, 1849. A handsome memorial monument was erected by the city of New York at the junction of Broadway and Fifth Avenue, beneath which rest his remains.

Worthen, WILLIAM EZRA: civil engineer; b. at Amesbury, Mass., Mar. 14, 1819; graduated at Harvard College 1838, and prior to 1849 was engaged in hydraulic surveys and constructions in Massachusetts. In 1850 he began work in New York city as an architect and engineer, designed the floating grain-docks for the Erie Railway at Jersey City, the dam over the Mohawk river at Cohoes, many large buildings, and the water-works of several cities. He built the first pumping-engine at High Bridge, New York city, and acted as consulting engineer for several cities and important commissions. He wrote papers on hydraulic and sanitary subjects, and in 1887 he was president of the American Society of Civil Engineers. He published *Cyclopædia of Drawing* (New York, 1857); *First Lessons in Mechanics* (1862); and *Rudimentary Drawing for Schools* (1863). D. in New York, Apr. 2, 1897. MANSFIELD MERRIMAN.

Worthing: town; county of Sussex, England; on the English Channel; 10 miles W. of Brighton and 56 miles S. S. W. of London (see map of England, ref. 14–J). It is a fashionable watering-place and winter resort; it has a beautiful promenade along the shore, and a pier 320 yards long. Fruit-growing under glass is extensively carried on. Pop. (1891) 16,606.

Worthington: town (laid out in 1853); Greene co., Ind.; at the junction of the White and Eel rivers, and on the Evans. and Terre Haute and the Pitts., Cin., Chi. and St. L. railways; 46 miles N. E. of Vincennes, 71 miles S. W. of Indianapolis (for location, see map of Indiana, ref. 9–C). It is an important shipping-point for corn, wheat, and live stock, and has 4 churches, public high school, 2 private banks, 2 weekly newspapers, and flour, woolen, planing, and saw mills. Pop. (1880) 1,185; (1890) 1,448; (1900) 1,448.

EDITOR OF "SEMI-WEEKLY TIMES."

Worthington: village; capital of Nobles co., Minn.; on the Burl., Cedar Rap. and North. and the Chi., Minn., St. P. and Om. railways; 30 miles S. W. of Windsor, 92 miles N. E. of Sioux City, Ia. (for location, see map of Minnesota, ref. 11–B). It is in an agricultural and stock-raising region, near Lake Okabena, and has a public hall, public library, flour-mill, elevator, a State bank with capital of $50,000, a private bank, and a daily and three weekly newspapers. Pop. (1880) 636; (1890) 1,164; (1900) 2,386.

EDITOR OF "ADVANCE."

Wotton, Sir HENRY: diplomatist and author; b. at Bocton or Boughton Malherbe, Kent, Mar. 30, 1568; educated at Winchester School, at New College and Queen's College, Oxford; spent several years (1589–97) on the Continent, and became well acquainted with Italian literature, science, and art; was for some time secretary to Robert Devereux, Earl of Essex, whom he accompanied to Spain and Ireland, and at whose fall (1600) he took the precaution to revisit Italy, whence he was dispatched by Ferdinand I., Grand Duke of Tuscany, to warn King James of a plot against his life 1602; made his way to Scotland in disguise viâ Norway, under the assumed name of "Ottavio Baldi"; delivered his message to that monarch at Stirling, gaining his favor; returned to Florence; went to England on the accession of James, by whom he was knighted, and sent as ambassador to Venice (1604); was in the diplomatic service almost continuously for twenty years, chiefly at Venice; returned to England with broken fortunes 1624, and became provost of Eton College in 1625. D. at Eton in Dec., 1639. His *Poems* have been many times reprinted, usually in connection with those of Raleigh, but he is best known by his miscellaneous remains, entitled *Reliquiæ Wottonianæ* (1651), edited by his friend Izaak Walton, who prefixed a *Life*. Other of his works were *The Elements of Architecture* (1624) and *The State of Christendom* (1657).

Wotton, WILLIAM, D. D.: linguist and author; b. at Wrentham, Suffolk, England, Aug. 13, 1666; was able at five years of age to translate chapters and psalms from the Hebrew, Greek, and Latin into English—attainments which were minutely described by his father in a pamphlet published the following year (1672); was admitted to Catherine Hall, Cambridge, in his tenth year, when Dr. John Eachard, master of the college, certified (Apr. 1, 1676) that his classical attainments were equal to those of Hammond or Grotius; graduated as bachelor of arts at twelve years of age (1679), at which time he was acquainted with twelve languages, and was able to repeat an entire sermon after a single hearing; became fellow of St. John's College, Cambridge, 1685; took orders in the Church of England, and was presented with the sinecure living of Llandrillo, Denbighshire, 1691; became chaplain to the Earl of Nottingham, who gave him the rectory of Middleton Keynes, Buckinghamshire, 1693; was made prebendary of Salisbury 1705; retired to his Welsh living 1714, and was able soon afterward to preach in Welsh; author of *Reflections upon Ancient and Modern Learning* (London, 1694; 3d ed. 1705); *The History of Rome from the Death of Antoninus Pius to the Death of Severus Alexander* (1701); *Miscellaneous Discourses relating to the Traditions and Usages of the Scribes and Pharisees* (2 vols., 1710), translated from the Mishna; and editor of the *Laws of Howel the Good* (1730), in Welsh and Latin, with a glossary. D. at Buxted, Essex, Feb. 13, 1726. Revised by S. M. JACKSON.

Wounds [O. Eng. *wund*: Germ. *wunde*; cf. Goth. *winnan*, suffer pain]: injuries classified according to their nature as (1) punctured wounds, made with pointed instruments; (2) incised wounds, produced by cutting instruments or sharp edges; (3) lacerated wounds, in which the borders of the wound are irregular, ragged, and torn, and the result of great force, injuries by dull instruments, or tearing; (4) contused wounds, which are accompanied by much bruising; (5) poisoned wounds, in which either an animal venom or virus, or some impure, poisonous, or irritating matter has gained entrance to the injured tissues and contaminated the blood; and (6) gunshot wounds, which as a rule are penetrating and may be lacerated, but differ from other wounds, owing to the character of the missile, the shock they give to the part and to the nervous system, and the grave complications to which they are liable. Contusions are also classed with wounds, but the contusion is not

properly a wound, since there is no actual solution of continuity of the flesh, unless it be an abrasion of the skin. The tissues at the seat of a contusion are often seriously injured, many minute blood-vessels are ruptured, and the escaped blood, settling in the tissues, causes an ecchymosis, a black or blue-black mottling of the part. As the blood is decomposed and slowly absorbed this color changes to blackish green, greenish yellow, dark leather-color and lighter shades, till it disappears. In other contusions there is subcutaneous laceration of tissues, or such shock to their vitality that they speedily disintegrate, and the devitalized part sloughs in a mass or becomes the seat of ulcers. Punctured wounds are relatively the most serious class, for they are often poisoned by the entrance, if not of venom or virus, of foreign matter, as rust, dust, splinters, clothing, etc., which cause suppuration at the bottom of the deep puncture, and lead to grave inflammation, erysipelas, and contamination of the blood by retained unhealthy fluids. The punctured wound is to be well washed, cleansed of all blood-clots and dirt, and if deep, or in the vicinity of dense fibrous tissue, as in the hand or foot, or near joints, must sometimes be freely cut and converted into an incised wound. Incised wounds heal in several ways. They heal most promptly and simply when perfectly smooth, clean cut, free from clotted blood, and in the flesh of persons in perfect health. Thus a clean cut whose borders do not gape or separate may, if instantly closed and sealed from the air by plaster or collodion, heal in a few hours, and approximately warrant the designation immediate union, or union by first intention. More often a day or two is required; the wound, being cleansed of clots or foreign matter, is exposed for a moment to the air, and closed either by adhesive plaster or stitches of silk, catgut, silkworm gut, or silver wire. The opposed surfaces are glazed over by a film of lymph, containing cells supposed to be identical with the white blood-corpuscles, and this, filling the interspace, agglutinates the walls of the wound and organizes a firm scar or cicatrix of fibrous tissue. Such speedy healing is termed union by adhesion, or primary union. When a wound has been lacerated, or a considerable area of tissue has been removed, the deficit has to be made up by a slower process of new tissue-growth; new cells develop one by one, in superimposed strata, until the level of the surface is reached, when the skin begins to heal and shoot over the raw area. This is the process of healing by granulation, or by second intention, far slower than the others, and, if the wound be large, a severe tax upon the strength and health of the patient. In lacerated wounds the more ragged points, if left, will be destroyed by sloughing before the wound can begin to heal, and the delay often converts the wound into a suppurating, weak, indolent ulcer; therefore it is better, in some cases, to remove the irregularities and convert the injuries into incised wounds, either straight or irregular, which can be brought together and heal. When an incised wound has failed of union by adhesion, its walls become covered with granulations, when they may sometimes be approximated and soon unite, constituting the process of union by secondary adhesion or by third intention. In granulation the growth of tissue may become exuberant and rise above the surrounding healing parts, or even the healthy intact surface. Such excess of granulation is popularly termed proud flesh. It must be reduced by use of astringents or compression, or destroyed by caustics, and the site stimulated to a healthier action. Poisoned wounds, as a rule, should be laid freely open by incision, treated by disinfectant lotions, and the general strength of the patient sustained by diet, tonics, and stimulants. Contusions are usually best treated by soothing lotions, as lead-water and laudanum, which may be applied cold or warm, as most agreeable to the patient. The healing of a wound is facilitated by pure air, regular hours for sleep, plain but nutritious diet, and abstinence from alcohol.

Revised by JOHN ASHHURST, Jr.

Wouverman, wow'ver-măn, PHILIPS: painter; b. at Haarlem, Netherlands, 1619; was baptized May 24. He was pupil of his father, Paulus Joosten Wouverman, a painter of whom no work has been identified. He studied landscape under Wynants. His work also shows the influence of Andries Both and Pieter van Laer. In 1640 he entered the guild of painters of Haarlem, of which he was elected dean for 1645–46. Wouverman's pictures are chiefly landscapes with figures of men and animals. He was especially fond of introducing horses, and painted hunting scenes or fighting cavalry. He is supposed never to have left his native Haarlem, but the character of some of his landscapes would seem to contradict this supposition. Wouverman was a prolific painter, and his works are to be found in most collections. D. at Haarlem, May 19, 1668. Pieter and Jan Wouverman were younger brothers of Philips, and also painted landscapes. See portrait and biography of Wouverman, *Historic Gallery of Portraits* (vol. iii.). W. J. S.

Wrack, or **Sea-wrack**: names applied to many seaweeds, especially to the *Fucaceæ*, useful as manures and as sources of iodine; also to wrack-grass, eel-grass, or grass-wrack, *Zostera marina*, a naiadaceous plant useful as manure, and extensively used for packing glass and pottery.

Wrangel, vrăng'el, FERDINAND, Baron, von: explorer; b. in Esthonia, Dec. 29, 1796; was educated in the naval academy of St. Petersburg; accompanied Capt. Golownin on his journey around the world 1817–19; commanded an expedition to the Polar Sea Nov. 2, 1820–Aug. 15, 1824; made a second voyage around the world 1825–27; was governor of the Russian possessions in North America 1829–34, and received on his return various high positions in the naval department, and was made an admiral. D. at Dorpat, June 6, 1870. His account of his polar expedition was published in Russian (2 vols., St. Petersburg, 1841), but an extract from his diaries appeared in German in 1839, and was translated into English by Mrs. Sabine in 1840—*Wrangell's Expedition to the Polar Sea in 1820–23*. See von Engelhardt, *Ferdinand von Wrangel und seine Reise* (Leipzig, 1885).

Wrangel, FRIEDRICH HEINRICH ERNST, Count von: general; b. at Stettin, Pomerania, Apr. 13, 1784; served in the Napoleonic wars, and rose rapidly in the service, attaining the rank of major-general in 1823. In the Danish war of 1848 he commanded the troops of the German Confederation, and in the same year he put down the insurrection in Berlin. In 1856 he was made general field-marshal. On the outbreak of the Danish war in Jan., 1864, he held the chief command of the allied Prussian and Austrian troops; but in the following May gave up the direction of the campaign to Prince Frederick Charles. D. in Berlin, Nov. 1, 1877.

Wrangel, KARL GUSTAF, Count: soldier; b. Dec. 13, 1613, at Skokloster, the family estate, on Lake Mälar, near Upsala, Sweden; received a military education, and fought in the Thirty Years' war under Gustavus Adolphus, Bernhard of Saxe-Weimar, Banér, and Torstensson. In 1644, after the death of Admiral Fleming, he received the command of the Swedish fleet which was destined to join the Dutch fleet and carry the Swedish army from the Danish peninsula to the islands, defeated the Danes off the island of Femern Oct. 11, and shut them up in the Bay of Kiel. In 1646 he was made commander-in-chief of the Swedish force in Germany; joined Turenne, and defeated the Austro-Bavarian forces repeatedly. Under Charles X. he commanded in the campaigns in Poland (1655) and in Denmark (1657–59), and in 1674 led the army of 16,000 men which suddenly invaded the country of the Elector of Brandenburg, who was a member of the coalition against Louis XIV. and was engaged with his whole force in the Rhine countries. But Wrangel's health failed, the elector hastened back with astonishing rapidity, and the Swedes were defeated at Rathenow and Fehrbelin, and driven out of Brandenburg. D. in the island of Rügen, June 24, 1676.

Wrangler [so called from the public disputations in which candidates for degrees were formerly required to take part; from deriv. of *wring* < O. Eng. *wringan, wrang*]: one of the first class of honormen of the mathematical tripos in the University of Cambridge, England. The number of these is not limited. The first of them is called the senior wrangler. See TRIPOS.

Wrasse [cf. Welsh *gwrachen* in *gwrachen y môr*, wrasse]: a name commonly applied in Great Britain to sea-fishes of the genus *Labrus*, family *Labridæ*. They have spiny fins, large thin scales, and the form, generally speaking, somewhat perch-like, with the back more straight. The mouth is protrusible, with thick, fleshy lips, folded so as to appear double. The dorsal fin is long and single; the spines of its anterior portion are surmounted with short membranous filaments, while those of the posterior portion have short and split rays. It generally frequents deep rocky gullies where the water is tolerably tranquil, and takes bait freely The colors are generally very brilliant, but fade quickly when the fish is taken out of the water. The species are numerous,

not large, and mostly inferior as food. The ballan wrasse or oldwife (*L. maculatus*) is one of the most common kinds. It attains a length of about 18 inches and a weight of more than 3 lb. It is bluish green, paler on the belly, all the scales margined more or less broadly with orange red, the blue prevailing in some specimens and the orange in others. It feeds on crustaceans, molluscs, and marine worms. See FISHERIES. Revised by F. A. LUCAS.

Wrath, Cape: See CAPE WRATH.

Wratislaw, ALBERT HENRY: author and divine; b. in England about 1822 of Bohemian parentage; educated at Christ's College, Cambridge; graduated in 1844; became head master of Felstead Grammar School in 1849, and of that at Bury St. Edmund's in 1857. In 1879 he resigned his position as head master, and became vicar of Manorbier, near Tenby, in Pembrokeshire, but resigned on account of ill health in 1887. Besides a number of school-books and religious treatises, he published many volumes of poems and prose translated from the Czech and other Slavonic languages, and thus became the principal promoter of knowledge of this important branch of studies in England. His more important works are *Lyra Czecho-Slovanská* (Boh. poems transl., 1849); *The Queen's Court MSS., with other Ancient Bohemian Poems* (1852; from the collection discovered in 1817 at Králové Dvor, Königinhof); *Barabbas the Scape-goat* (sermons, 1859); *Notes and Dissertations on Scripture* (1863); *Adventures of Baron Wratislaw of Mitrovicz in his Captivity in Constantinople* and *Diary of an Embassy from King George (Podiebrad) of Bohemia to Louis XI. of France in 1464* (both trans. from Czech); *Life, Legend, and Canonization of St. John Nepomuk* (1873); *Lectures on Bohemian Literature* (1878); *Life of John Hus* (1882); *Sixty Folk-tales from Slavonic Sources* (1889). Revised by HERMANN SCHOENFELD.

Wraxall, Sir NATHANAEL WILLIAM, Bart.: statesman and author; b. at Bristol, England, Apr. 8, 1751; was employed in civil and military service in India 1769–72; traveled for several years in Europe; was confidential agent of Caroline Matilda, Queen of Denmark, in her negotiations with her brother, George III., 1774–75; entered Parliament 1780; was created a baronet 1813; was imprisoned three months in 1815 for a libel on Count Woronzow, Russian envoy to England, in an autobiography published in that year. He was the author of several amusing volumes of anecdotical history, including *Memoirs of the Kings of France of the House of Valois* (2 vols., 1777); *History of France from Henry III. to Louis XIV.* (3 vols., 1795); *Memoirs of the Courts of Berlin, Dresden, Warsaw, and Vienna 1777–79* (2 vols., 1799); *Historical Memoirs of My Own Time, 1772–84* (2 vols., 1815; 3d ed., revised, 3 vols., 1818); and *Posthumous Memoirs of his Own Time, 1784–90* (3 vols., 1836; 3d ed. 1845; new ed. of whole work, 5 vols., 1884). D. at Dover, Nov. 7, 1831.

Wray, JOHN: See RAY.

Wreck [doublet of *wrack*, ruin, also seaweed < O. Eng. *wræc*, distress, exile (or Scandin. *rek*, anything driven ashore), from same root as O. Eng. *wrecan*, punish, drive > Eng. *wreak*: Germ. *rächen*: Goth. *wrikan*, punish; probably akin to Gr. εἴργειν, constrain, Sanskr. *vrj-*; akin is Eng. *wretch*]: at common law, vessels or parts of vessels or goods cast by the sea upon the land, within the limits of a county and there left. It is said by many writers that at early common law wreck belonged to the king, without regard to the claims of the owner; and that the statutes of Henry I., of Henry II., and Edward I. modified this rule by permitting the owner to recover his property provided a person or animal escaped from the wreck alive. Such was not the view of Lord Coke, who agrees with Bracton that the king shall have wreck as he shall have great fish, because none claims the property; that wreck is estray on the sea coming to land, as estray of beasts is on the land coming within any privileged place; and the law gives in both cases a year and a day to claim them. Whether wrecked property was forfeited by the owner to the crown or its grantees because no live animal came ashore was carefully considered by Lord Mansfield in *Hamilton* vs. *Davis*, 5 Burrows, 2732 (A. D. 1771). He declared no case had been produced on the argument to prove such forfeiture. In Great Britain the general superintendence of all matters relating to wreck is now confided by statute to the Board of Trade. In the U. S. common-law wrecks are matters of State jurisdiction generally, although the licensing of vessels to engage in wrecking, the disposition of property wrecked on certain coasts, and the control of the life-saving service are proper subjects for federal legislation. (See U. S. Revised Statutes, §§ 4239, 4240, 4241, 5358.) A fair sample of State legislation upon this subject is found in the New York Town Law of 1890 (ch. 569, §§ 137–150).

The term is also applied, in the law of marine insurance, to a ship so injured at sea as to become unnavigable, or unable to pursue her voyage without repairs exceeding the half of her value. See FLOTSAM, JETSAM, and LIGAN. FRANCIS M. BURDICK.

Wrede, *vrā'de*, KARL PHILIPP, Prince: Bavarian field-marshal; b. at Heidelberg, Apr. 29, 1767; studied jurisprudence at the university there, and in 1792 became assessor to the higher court. In the following year he was chosen commissioner for the Palatinate to the Austrian army. After serving in this capacity for five years, he raised a corps of troops with which he joined the Austrian forces, and fought in the campaigns of 1799 and 1800. On the return of peace he organized the Bavarian army, and when war broke out anew fought on the side of the French against his former allies, the Austrians. In the campaign that ended at Austerlitz he distinguished himself in several battles, but more particularly in the campaign of 1809 and in his pacification of the Tyrol. Napoleon rewarded him with the rank of field-marshal, and made him a count of the empire. In the retreat from Moscow he commanded the Bavarian forces; but with the change in Napoleon's fortunes Bavaria returned to the side of his enemies, signing a treaty with the allies on Oct. 8, 1813, and in the ensuing campaigns Wrede was again fighting against the French. At the head of some 40,000 men he tried to cut off Napoleon's retreat at Hanau (Oct. 30–31), but was defeated. In the campaign of 1814, however, he was successful, and after the war was made field-marshal and prince by the Bavarian Government. He was afterward active in Bavarian politics, and held several important diplomatic positions. D. at Ellingen, in Bavaria, Dec. 12, 1838. F. M. COLBY.

Wren [O. Eng. *wrenna*, *wrænna*]: any member of the family *Troglodytidæ*, a group of song birds having ten primaries, a slender bill, and scutellate tarsi. They vary in appearance and habits, but the plumage is generally more or less brown with fine dark bars, and the birds pass much of their time on or near the ground, some being partial to marshes, where they build large round nests among the rushes. Others nest in bushes, hollow stumps, or holes in branches. The eggs are six or eight in number, usually white with fine reddish spots, and two or three broods are raised in a season. None is found in Africa, and only fifteen species in Europe and Asia, while nearly 150 species occur in America, their headquarters being in the tropics. Fourteen species with nine sub-species dwell in the limits of the U. S. The common European species, *Troglodytes parvulus*, is, next to the kinglet, the smallest bird in Europe; its nearest relative in the U. S. is the winter wren, *T. hiemalis*, a little bird found over the greater portion of North America. It is shy, with short wings and a shorter tail; dark brown above, whitish below, barred with blackish. The house wren, *Troglodytes aëdon*, is another common species, often nesting in boxes. The cactus wren, *Campylorhynchus brunneicapillus*, of the southwest, is a large species, 8 inches long, and a representative of numerous Central and South American forms. See the article NESTS OF BIRDS. F. A. LUCAS.

Wren, CHRISTOPHER, Sir: architect; b. at East Knoyle, Wiltshire, England, 1632. He entered Wadham College, Oxford, graduated 1650 and was made fellow of All Souls College, Oxford, in 1653, and Savilian Professor of Astronomy 1660. At Oxford he made a great reputation as a geometrician. In view of his mathematical reputation he was much consulted in matters of building. Architecture, which had been little regarded in the reign of Charles I., scarcely existed during the civil wars and under the Commonwealth. Immediately after the restoration of Charles II. Wren served on a commission for the repair and partial rebuilding of old St. Paul's, the Gothic cathedral of London. The next year (1664) he began his first building, the chapel of Pembroke College at Cambridge, which his uncle Matthew Wren, Bishop of Ely, intended to be a memorial of his release from the Tower, where he had been imprisoned for eighteen years. The next year he began the Sheldonian theater at Oxford. The building is intended to imitate a Roman theater, at

least in its general proportions, and the ceiling was made flat, perhaps to suggest the awning stretched over the unroofed ancient building. The library of Trinity College at Cambridge was begun in 1665, though not finished for many years. In 1665 Wren went to France, where he made the acquaintance of Bernini and François Mansart. The Great Fire in London in Sept., 1666, gave him at this time a singular opportunity for impressing his ideas of architecture upon a whole community. The Cathedral of St. Paul was entirely ruined, and it was proposed now, as it had been before the fire, to rebuild the church in what the architects of the seventeenth century supposed to be the Gothic style. Wren's first design showed a large dome surrounded by small ones arranged almost in a ring; another small dome covered a vestibule, into which access was given through a portico of columns. This design, combining many Byzantine features with a Roman exterior in one order and kept down to the dimensions of the model, about 450 feet in length, would have resulted in a noble church of the second class, and one of the most interesting buildings in Europe. The design was abandoned, however, when in 1675 the first stone was laid and the larger and longer church now existing was begun. Previous to this, and probably in consideration of his services as adviser and engineer in the matter of laying out the rebuilt city of London, he had been knighted. In 1681 he was made president of the Royal Society, in 1697 the choir of the cathedral was open for service, in 1710 the last stone was put in place. During all these years Wren was engaged upon public and private buildings, of which he undertook more than by any possibility one man could design or direct. It is hardly an exaggeration to say that every important building, at least in the south of England or in the vicinity of London, from 1666 until about 1710, was put in his hands. He built Winchester Palace, which is now used as a barrack, a large additional structure to Wolsey's Palace at Hampton Court, and Chelsea Hospital, and began the great hospital at Greenwich. He built the town-hall at Windsor, Marlborough House and Buckingham House in London, the Royal Exchange, the Custom-house, the Ashmolean Museum at Oxford, Queen's College chapel at the same place; and at Cambridge, Trinity College Library, as well as Pembroke College chapel, named above. His most notable work, however, is the great series of churches in London and elsewhere which Wren carried out during his forty-five years of active practice. Of these may be named St. Michael's, Cornhill; St. Bride's, Fleet Street; St. Mary-le-Bon, with its remarkable and much admired steeple; St. Stephen's, Walbrook, with an interesting vaulted interior and a large cupola; St. Lawrence, Jewry, whose interior is a noble and beautiful hall about 70 feet in clear span and over 80 feet long with a flat ceiling 40 feet above the floor—all these in London. Another much admired London church is St. James's, Piccadilly, of which the elaborate vaulted roof, praised by writers on architecture for its proportions, is in reality a piece of carpenter work with sham vaults, and even with this the supports below the gallery are very large square piers used as pedestals for the columns above. Wren was never very careful about such constructional matters as these.

Wren sat in Parliament for many years during his later life. Throughout the reigns of James II., William III., and Anne he was kept constantly busy in public duties of many kinds. The actual work of his office had to be done by his assistants, and attempts have been made to distinguish in the architectural work under Wren's name the designs of these different artists. Wren died in 1723 and was buried under the choir of St. Paul's Cathedral. In the choir above was placed the tablet, now removed to another part of the church, which bears the well-known inscription, "Si monumentum requiris circumspice." See *Biographies* by James Elmes and by Miss Phillimore. RUSSELL STURGIS.

Wrestling: an athletic sport in which each of the two contestants endeavors to throw his opponent to the ground. It is one of the oldest as well as the most universal of athletic exercises. It flourished most among the ancients, and was a prominent feature of the Olympian games. Among the Greeks, the competitors trained for months prior to the competition, and the victor was fêted, processions formed in his honor, special privileges were conferred upon him, and in some of the cities his statue was placed in one of the temples. Most famous among the ancient wrestlers was Milo of Croton, six times the winner at the wrestling competitions at both Olympian and Isthmian games. Among the earliest Jewish records are references to wrestling long before the era of history, and sculpture takes us back still further into the antiquity of this particular form of sport. Homer's account of the match between Ajax and Ulysses (*Iliad.*, 23–710) is probably the most perfect account that remains to us of these ancient competitions. Pausanias states that Theseus made the first wrestling rules. During the Homeric age the wrestlers were naked with the exception of the loin cloth. This custom continued until the fifteenth Olympiad. In the time of Solon oiling and dusting were practiced, and there seems to have been some especial significance attached to the dusting process, since we read that dust brought from certain localities was much more highly prized by the wrestlers than that from others. In Argos flute music for a time accompanied the wrestling. There were two distinct types of wrestling among the ancients, one where the competitors stood and struggled for a fall, and the other, in which the competition might still go on after the competitor was upon the ground, until a specified part of the body was on the ground. Falling on the face did not constitute a fall. If a man was thrown three times from the standing position he was beaten. Wrestling for boys was introduced at the Olympian games and at Athens, Elusinia, and Thesea. The old Greek rules forbade striking and kicking, but allowed breaking of fingers, throttling, etc. Wrestling competitions were popular in the olden times in the British isles, and contests were held annually in London on St. James's Day, at which time we find a ram was offered for the prize. Another prize commonly offered in Old England was a cock.

In later times some distinct kinds of wrestling have been developed, in both Great Britain and the U. S. One of the best known of the English styles, is that practiced in Cumberland and Westmoreland, and is known under this combined name. Here the competitors usually dressed in close-fitting and becoming costumes. The rules compelled them to stand chest to chest, each placing his chin on his opponent's right shoulder, and grasping him around the body, each placing his left hand above the right of his antagonist. If either party breaks his hold, though not on the ground, the one so letting go is the loser. If either touch the ground with any part of the body except the feet, he shall be deemed the loser.

Another famous style is that of the Cornish and Devonshire men. The greatest rivalry exists between Cornwall and Devon. Here kicking was formerly allowed, and heavy-soled shoes, sometimes with thin steel plating inserted within the leather, were worn, so that the injuries resulting from the game were serious. The judging is exceedingly difficult, and the amount of quarreling resulting therefrom has brought the Cornish and Devonshire wrestling into disfavor. It is required that both hips and one shoulder, or both shoulders and one hip (or sometimes both shoulders and both hips) reach the ground simultaneously, and this before any other portion (as the arm or knee) of either thrower or thrown reaches it.

The Lancashire style is the roughest of all the English wrestling. It allows catching by the legs, wrestling on the ground, and other equally objectionable features. The wrestlers combat in stockinged feet, and are not allowed to scratch, strike, or maim. A fall is constituted by both shoulders touching the ground.

The Scotch style is largely modeled after that of the Lancashire.

In the French style the wrestlers are allowed to take hold from the head to the waist. Tripping is prohibited. Competitors are not allowed to strike, scratch, or to clasp hands, although they may grasp their own wrists or other portions of their own bodies. They may not wrestle bare-footed, but in the stocking. If one of the wrestlers falls on his knee, shoulder, or side, he must begin again. The one whose shoulders first touch the ground is the loser, providing both shoulders are on the ground at the same time.

The German style is a struggle on the ground. The wrestlers can catch hold of the legs, or indeed anywhere below the waist. This wrestling starts with the men standing erect, but is usually finished by a competition on the ground, an effort being made to turn the fallen man so that his shoulders may rest upon the ground.

The Græco-Roman is not much favored. Like some of the previous styles it allows only of the clasping of the body above the waist, and does not permit of wrestling upon the ground.

The much more popular style is the catch-as-catch-can. Here all brutal playing is barred by the rules, and yet there is always more or less savage work that is really unsportsmanlike. The competitor may twist a head or a foot to the extremes of safety, but it is always within the power of the sufferer to relieve himself from the punishment by admitting a fall. In this, as in the Græco-Roman style, a fall is lost when both shoulders touch the ground.

See J. P. Mahaffy's *Old Greek Education, Fencing, Boxing, and Wrestling*, in the Badminton Library (London and New York); and Strutt's *Sports and Pastimes of the English People.* E. HITCHCOCK, Jr.

Wrexham: town; in Denbighshire, North Wales; 12 miles S. W. of Chester (see map of England, ref. 8–F). It has a fine church of the fifteenth century with a finely decorated tower 135 feet high, rich coal and lead mines in the vicinity, and extensive breweries, iron-works, and paper-mills. Pop. (1891) 12,552.

Wright, CARROLL DAVIDSON, M. A.: statistician; b. at Dunbarton, N. H., July 25, 1840; received an academic education; began the study of law 1860; enlisted as a private in the Fourteenth Regiment, New Hampshire Volunteers, 1862, and became in December, 1864, colonel of the regiment; 1865 returned to the study of law in Boston, and was admitted to the bar in New Hampshire in the same year. In 1871 he was elected to the State Senate of Massachusetts and served two terms. In 1873 he became chief of the bureau of statistics of labor of Massachusetts, which position he held until Sept., 1888. In this position he developed a system of labor statistics which became the model for all similar work. In 1875 and 1885 he had charge of the census of Massachusetts, and in the latter year was appointed U. S. commissioner of labor. He has lectured on statistical and social subjects before several universities. In 1895 he was appointed Professor of Political Science in the Catholic University of America, Washington, D. C. He has published *Annual Reports of the Massachusetts Bureau of Statistics of Labor* (15 vols., Boston, 1873–88); *Census of Massachusetts* (1876–77); *The Statistics of Boston* (1882); *The Factory System of the United States* (1882); *The Census of Massachusetts* (1887–88); *Reports of the United States Commissioner of Labor, including Industrial Depressions* (1886); *Convict Labor* (1886); *Strikes and Lockouts* (1887); *Working Women in Large Cities* (1888); *Railroad Labor* (1889); *Marriage and Divorce* (1889); *Cost of Production of Iron, Steel, etc.* (1890): *Cost of Production of Textiles and Glass* (1892); and *The Industrial Evolution of the United States* (1895); besides numerous pamphlets. C. H. THURBER.

Wright, CHARLES H. H.: See the Appendix.

Wright, ELIZUR: journalist; b. at South Canaan, Conn., Feb. 12, 1804; graduated at Yale College 1826; taught in the Lawrence Academy at Groton, Mass., 1827–28; was Professor of Mathematics and Natural Philosophy in Western Reserve College 1829–33; became secretary of the American Anti-Slavery Society 1833; edited the paper *Human Rights* 1834–35 and the *Quarterly Anti-Slavery Magazine* 1837–38; removed to Boston 1838; became editor of the *Massachusetts Abolitionist* Apr., 1839, of the *Daily Chronotype* 1845, and of its successor, the Boston *Commonwealth*, 1850; he also edited for short periods the Boston *Daily Chronicle* and the *American Railway Times*; was commissioner of insurance for Massachusetts 1858–66; translated La Fontaine's *Fables* (2 vols., Boston, 1841; 2d ed. New York, 1859): wrote an introduction to Whittier's *Ballads and other Poems* (London, 1844); *Savings Bank Life Insurance with Illustrative Tables* (1872); *The Politics and Mysteries of Life Insurance* (1873); contributed to the *Atlantic Monthly*, and published several anti-slavery pamphlets. D. at Medford, Mass., Nov. 22, 1885. Revised by H. A. BEERS.

Wright, FANNY: See D'ARUSMONT, FRANCES.

Wright, GEORGE FREDERICK, D. D., LL. D: theologian and geologist; b. at Whitehall, N. Y., June 22, 1838; graduated at Oberlin College 1859, and at Oberlin Theological Seminary 1862; served in the Union army in the civil war (1860); became pastor at Bakersville, Vt., 1862, and at Andover, Mass., 1872. He was made Professor of New Testament Literature in Oberlin Theological Seminary in 1881. In 1881 he was assistant geologist on the Pennsylvania survey, and since 1884 has been connected with the U. S. survey in the division of glacial geology. He has published *The Glacial Boundary in Ohio*, etc. (Cleveland, 1884); also *The Logic of Christian Evidences* (Andover, 1880); *Studies in Science and Religion* (1882); *The Relation of Death to Probation* (1882); *The Divine Authority of the Bible* (Boston, 1884); *Man and the Glacial Period* (1892). G. P. F.

Wright, HORATIO GOUVERNEUR: soldier; b. at Clinton, Conn., Mar. 6, 1820; graduated at U. S. Military Academy, and commissioned second lieutenant in the Corps of Engineers July 1, 1841. In 1856 he was called to Washington, and served as assistant to the chief of engineers until the outbreak of the civil war in 1861. At the first battle of Bull Run he was chief engineer of Heintzelman's division. He was commissioned a brigadier-general of volunteers Sept. 14, 1861, and commanded a brigade of the land forces of the Port Royal expedition. In Feb., 1862, he set out from Port Royal with a brigade of volunteers, and by the middle of March had occupied Fernandina, Jacksonville, St. Augustine, and retaken possession of Fort Marion and Fort Clinch. Promoted major-general of volunteers in July, 1862, he commanded the department of the Ohio until Mar., 1863. He led a division in the battle of Gettysburg, and in the spirited assault on Rappahannock Station (Nov. 7, 1863) after the Mine Run affair. On May 9, 1864, he succeeded to the command of the Sixth Corps; was present with the Army of the Potomac at every engagement up to July, 1864, when summoned from the front of Petersburg with his corps to the defense of Washington, then threatened by the Confederates under Gen. Early. Wright pursued the latter and defeated him at Snicker's Gap. In the ensuing campaign of the Army of the Shenandoah under Sheridan he led his corps at Opequan and Fisher's Hill, and was in command of the army at Cedar Creek. Mustered out of volunteer service in Sept., 1866, he returned to duty with the Corps of Engineers, in which he had attained a lieutenant-colonelcy Nov., 1865. For gallantry at Spottsylvania he was breveted colonel; brigadier-general for Cold Harbor; and major-general for capture of Petersburg. He was a member of the board of engineers for fortifications 1867–79; was promoted colonel Corps of Engineers Mar., 1879, and on June 30, 1879, brigadier-general and chief of engineers, which position he occupied until he was retired Mar. 6, 1884. D. July 2, 1899.
Revised by JAMES MERCUR.

Wright, JOSEPH, called Wright of Derby: painter; b. at Derby, England, Sept. 3, 1734; studied portrait-painting under Thomas Hudson; resided in Italy 1773–75; settled in Derby 1777, remaining there through life, occupied chiefly with portraits, but painting also historical and figure pieces; was especially fond of representing the effects of firelight, which he had carefully studied in Italy during an eruption of Vesuvius; exhibited at Covent Garden in 1785 a collection of twenty-four of his pictures, the most striking of which was the *Destruction of the Floating Batteries off Gibraltar.* D. at Derby, Aug. 29, 1797. See the *Life* by Bemrose (1885).

Wright, ROBERT EMMET: b. at Allentown, Pa., in 1810; became a distinguished member of the Pennsylvania bar, practicing in his native place. He published *Pennsylvania State Reports, etc.* (14 vols., 1861–66); edited William Graydon's *Forms of Conveyancing* (1845) and Samuel Roberts's *Digest of Select British Statutes, etc.* (1847); prepared digests of the laws of Pennsylvania on constables' duties, on aldermen and justices of the peace, and of several different periods of adjudged cases; besides writing essays and addresses on legal and political topics, and editing several legal works.
Revised by F. STURGES ALLEN.

Wright, SILAS: statesman; b. at Amherst, Mass., May 24, 1795; graduated at Middlebury College, Vermont, 1815; studied law; was admitted to the bar 1819; settled at Canton, St. Lawrence co., N. Y.; was elected to the State Senate as a Democrat 1823; distinguished himself as an opponent of the policy of Gov. De Witt Clinton; developed in a report to the Senate in 1827 the financial policy with which he was identified throughout his political career; was commissioned brigadier-general of State militia 1827; was a member of Congress 1827–29; was comptroller of New York 1829–33, and U. S. Senator 1833–44; supported Clay's Compromise Bill and defended the removal of the deposits from the U. S. Bank by President Jackson 1833; opposed the recharter of the U. S. Bank and the distribution of the surplus Federal revenues among the States; was chosen Governor of New York in the exciting campaign of 1844; took decided ground against the anti-rent rioters, declaring Delaware County in a state of insurrection; repeatedly declined appointments to foreign missions, as well as an offer of a seat in the cabinet or on the Supreme bench by President

Tyler, and of the secretaryship of the Treasury by President Polk 1845; was defeated as a candidate for re-election 1846, and retired to his farm at Canton, where he died Aug. 27, 1847. Biographies were published by Jabez D. Hammond (1848) and John S. Jenkins (1852).

Wright, Thomas: philologist and antiquarian; b. on the Welsh border, near Ludlow, Shropshire, England, Aug. 21, 1810; entered Trinity College, Cambridge; graduated 1834; settled in London as a professional man of letters 1835; was one of the founders of the Camden Society (1838), the Percy and Shakspeare societies (1840), and the British Archæological Association (1843), editing its *Journal* and other publications until 1850, when he withdrew in consequence of the divisions which led to the foundation of the Society of Antiquaries, of which he became a fellow; was a prominent contributor to the *Archæologia*; rendered services to M. Guizot's French record committee, which procured him while still young (1842) the honor of an election as corresponding member of the Institute (Académie des Inscriptions et Belles-Lettres); was the originator in England of the annual archæological congresses (1844), and successfully conducted the excavations upon several Roman sites in Britain, especially those which brought to light the remarkable ruins of the Roman Uriconium at Wroxeter, Shropshire. He wrote or edited above eighty volumes, nearly all connected with British history, philology, or archæology, and was selected by the Emperor Napoleon III. to translate his *History of Julius Cæsar* (2 vols., 1865–66). He edited many of the literary relics of the Middle Ages in English, Anglo-Norman, French, and Latin—*Feudal Manuals of English History* (1872); *The Anglo-Latin Satirical Poets* (1872); and *The Works of James Gillray* (1873), etc. Among his numerous original works are *The History of Ludlow and its Neighborhood* (2 parts, 1841–43; new ed. 1852); *Biographia Literaria* (2 vols., 1842–46), comprising the Anglo-Saxon and Anglo-Norman periods of Great Britain and Ireland; *The Archæological Album* (1845); *A History of Ireland* (3 vols., 1848–52); *The Celt, the Roman, and the Saxon* (1852; 3d ed. 1875); *The Wanderings of an Antiquary* (1854); *A Dictionary of Obsolete and Provincial English* (2 vols., 1857); *Essays on Archæological Subjects* (2 vols., 1861); *A History of Domestic Manners in England during the Middle Ages* (1862); *A History of Caricature and Grotesque in Literature* (1865); *Womankind in Western Europe* (1869); and *Uriconium, an Historical Account of the Ancient Roman City* (1872). D. at Chelsea, Dec. 23, 1877. Revised by Henry A. Beers.

Wright, William, Ph. D., LL. D.: Orientalist; b. in Bengal, India, Jan. 17, 1830; educated at the Universities of St. Andrews and Halle; was appointed Professor of Arabic in University College, London, 1855, in Trinity College, Dublin, 1856, and in the University of Cambridge 1870; became employed in the MS. department of the British Museum in 1861, and became assistant keeper 1869. He edited in Arabic the *Travels of Ibn Jubair* (Leyden, 1852); Al-Makkari's *Analectes* (1855); *Opuscula Arabica* (1859); and El-Mubarrad's *Kamil* (Leipzig, 11 parts, 1864–82); issued *The Book of Jonah in Four Oriental Versions—Chaldee, Syriac, Ethiopic, and Arabic—with Glossaries* (London, 1857); a revised translation of Caspari's *Grammar of the Arabic Language* (2 vols., 1859–62; new ed. 1875); *Ancient Syriac Documents relative to the Earliest Establishment of Christianity in Edessa, etc.* (1864); *Contributions to the Apocryphal Literature of the New Testament, collected and edited from Syriac MSS. in the British Museum, with an English Translation and Notes* (1865); *The Homilies of Aphraates, "the Persian Sage"* (in Syriac, 1869); *An Arabic Reading-book* (1870); *The Apocryphal Acts of the Apostles* (Syriac and English, 2 vols., 1871); *A Catalogue of the Syriac MSS. in the British Museum* (3 vols., 1870–72); *Oriental Series of Fac-similes of Ancient Manuscripts* (1876); *The Chronicle of Joshua the Stylite* (1882); *The Book of Kalilah and Dimnah* (1883): and *The Empire of the Hittites* (1884). D. in Cambridge, May 22, 1889.
Revised by S. M. Jackson.

Wright, William Aldis: author and editor; b. in England about 1836; educated at and became librarian of Trinity College, Cambridge; was the principal contributor in biblical geography and biography to Dr. Smith's *Dictionary of the Bible* (3 vols., 1860–63), and corrected the proofs of that important work and made the abridgment (1865); edited with notes and glossarial indexes Bacon's *Essays* (1862) and his *Advancement of Learning* (1869); was co-editor with William George Clark of *The Cambridge Shakspeare* (9 vols., 1863–66), and the Globe edition of Shakspeare's *Complete Works* (1 vol., 1864); and edited *The Bible Word-book* (1866), Chaucer's *Clerke's Tale*, the *Metrical Chronicle* of Robert of Gloucester and other works.
Revised by S. M. Jackson.

Wrightsville: borough; York co., Pa.; on the Susquehanna river, the Susquehanna and Tidewater Canal, and the Penn. Railroad; 11 miles N. E. of York, the county-seat, and 31 miles S. E. of Harrisburg (for location, see map of Pennsylvania, ref. 6–G). It has 6 churches, 8 graded schools, a national bank with capital of $150,000, a weekly newspaper, several saw and planing mills, lime-kilns, foundry, blast furnace, and tobacco, cigar and furniture factories. Pop. (1880) 1,776; (1890) 1,912; (1900) 2,266.
G. S. Tinsley, Borough Solicitor.

Writ: in law, a formal instrument, issued by or under authority of a court, commanding the person to whom it is addressed to do a certain act therein specified. It is written in the form of a mandate from the highest authority in the state—the king in Great Britain, the President, people, or commonwealth in the U. S.—attested by the chief judge of the court, sealed and signed by the clerk, and may be issued either at the commencement of an action or proceeding, or during its progress, to the sheriff or to some other person, for the purpose of procuring various acts to be done in connection with such action or proceeding. Anciently, actions in the courts of law were commenced by a species of writs termed "original," which were issued by officers of the chancery, and were considered as the direct mandates of the king, stating the nature of the claim, and laying the jurisdiction of the judge to try the case; but they were long ago abolished, and all writs became "judicial"—that is, were in the nature of process from the court in which the suit was brought or was pending. In the common-law practice the number of writs was very great; a separate one was adapted to every special proceeding and to almost every important stage in an action, and each had its appropriate name. Among the most familiar were the writs of "*capias*" and of "summons" for commencing legal actions, the writ of "*subpœna*" for summoning the defendants in an equity suit and for compelling the attendance of witnesses (see Subpœna), the writs of "error" and of "*certiorari*" for the review of judgments and other judicial decisions, and the writ of "*habeas corpus*" for the production of a person imprisoned in order that the cause of his detention might be inquired into. (See Habeas Corpus.) A large part of the common-law writs have been abolished by statute both in the U. S. and in Great Britain, especially those for which some other simpler and more direct substitute could be made. Some of the more common and important, however, have been retained in those States which adhere to the ancient system of practice. In those States which have adopted code procedures writs have been almost wholly abrogated in civil actions, and simple orders of a court or a judge, or notices, have been substituted in their places. In these States, however, a few important writs belonging to the criminal practice, together with the writs of *habeas corpus* and of *certiorari*, and some others of less importance, are still used, though in a somewhat modified form. See Process, Procedure, Capias, Certiorari, etc. Revised by F. Sturges Allen.

Writer's Cramp: See Neurosis.

Writers to the Signet, or **Clerks to the Signet**: a legal body, constituting an incorporation by immemorial custom, of lawyers having much the same general duties and privileges in the Supreme Courts in Scotland that Attorneys and Solicitors (*qq. v.*) have in England. They are said to have anciently been clerks in the office of the Secretary of State, by whom writs passing the signet were prepared. When the College of Justice (that is, the supreme civil court of Scotland, composed of the lords of council and session and of the members and officers of court) was established the writers to the signet exercised about the same functions as they do to-day, and they are recognized as members of that college. Formerly they alone had the privilege of preparing such summonses as could not pass the signet without a bill, but this privilege is now essentially modified. All crown writs, however, including charters, precepts, and writs from the sovereign or Prince of Scotland must be prepared by them. Admission to the body is by apprenticeship for a period of five years, except for those holding university degrees in law or the arts, and for some other specially excepted classes of men.
F. Sturges Allen.

Writing [O. Eng. *wrītan*, write, liter., scratch, score : O. Sax. *wrītan*, write, tear : O. H. Germ. *rīzan* > Germ. *reissen*, tear : Icel. *rīta*, write : Goth. *writs*, stroke, dash, letter]: the art of conveying ideas by means of signs inscribed on some material. It may be either ideographic or phonetic, and is distinguished from the pictorial—that is, from illustrations intelligible independently of language (though not from numerals) by the fact that it must represent words, either by a sign for a word, or by signs for the more or less accurate or simple vocal word-elements. This distinction does not exclude the hieroglyphic or the cuneiform determinatives from writing proper, though their strict office lies outside of representing vocables. In fact, they are less common in the older Egyptian than the later, and thus belong among the conveniences, like capitals, punctuation, etc. Writing, as representing words, primarily represents sounds ; but to say nothing of those words which are coined and written and understood (book-words), though scarce ever pronounced, the sounds of many words written in ancient symbols are wholly lost, though the meaning is retained. *Ideographic writing* is that in which a single character stands for a word, as in Chinese ; *phonetic writing*, that in which the vocal elements are more or less approximately represented by separate characters ; *alphabetic*, when the characters are letters, as in most Western languages ; *syllabic*, when the character stands for a syllable, as in the ancient Babylonian and Assyrian, the Cypriote and the Ethiopic, and the modern Japanese. In all systems writing is an imperfect representation of the sound, the ideograph generally failing to give the inflection necessary to the word-meaning, besides standing for different words in different connections. Phonetic writing fails in representing the finer shades of sound or accent even in such uniform systems as the German, Spanish and Italian, and the pointed Hebrew ; and it requires a large element of the conventional in French, and especially in English ; while in the Semitic languages generally the omission of vowels, and treating them as mere supplementary modifications of the vocal effort represented by the consonants, is, if possible, a greater defect in the system of signs than any of the others mentioned. Writing thus never has been, nor can be, a perfect representation of sounds, i. e. of the spoken language proper, since different readers may give to it a variety of renderings, so as almost to change the main thought ; yet, by its introduction of pauses and other distinctions, it is a positive addition to oral language as a means of communicating ideas, to say nothing of its peculiar province of recording them. Writing doubtless descended through various inventive steps from signs purely pictorial ; but it must be one of the oldest of the arts. The descent of nearly all the civilized alphabets from the Phœnician shows a general spread and adaptation, rather than repeated independent invention ; and of some alphabets, as the Mæso-Gothic and the Armenian, we have almost the exact time of their beginning—the one, third or fourth century A. D., the other, the fifth. The Cypriote syllabary, which seems to go back at least to 900 B. C., bears very strong marks of invention for a considerable portion of it, but obscurity as yet covers its origin. In the U. S. the generation is scarce passed that saw the pictorial communications called the "Indian newspaper," not yet advanced to be writing, and our own times the invention of syllabic and alphabetic writing proper by native American Indians, of which specimens may be seen in the publications of the American Bible Society. These, by the by, are almost the only original syllabic systems of which the original specimens are on a flexible writing material, the syllabic systems of Western Asia being on stone or pottery, and the Ethiopic, etc., on parchment and paper, being rather alphabetic characters with syllabic attachments than syllabic characters proper. The alphabetic system is that of most countries of the world, and, although certain excellent scholars assert that the Chinese language does not admit of the use of an alphabet, yet the Japanese can do so, and there are powerful societies and individuals who are doing their best to induce all the Japanese to use Roman letters. The languages of the Pacific isles and of most of the tribes of Africa are expressed in the same alphabet, and the signs of the times foreshadow that the alphabetic system, as it is the best, will be the only one. The learned of Europe and America use the Roman alphabet, with modifications, for a host of Oriental languages, the only obstacle to the nearly universal use of this method being the love which Semitic scholars show for too complicated a system and fonts of type.

The facts above stated, with the additional ones that spoken language itself changes, and that ignorance is almost as strong a factor as learning in bringing this about, together with changes of fashion (such as any type-founder's book of specimens exhibits), account for a multitude of variations in the appearance of the written page, producing what are commonly called different alphabets, though in the same language, as Roman, Old English, etc., along with a multitude of other matters of which the palæographer has to take account, but, of course, with caution, especially to distinguish that which is sporadic from that which forms the general course of change, with the added caution that great changes are often sudden, and a reaction sets in later. The oldest Phœnician letters are more like the modern Roman and Greek than those of many intervening ages. The earliest printed Greek type had far fewer ligatures than the fonts of thirty years later, and the latter had far fewer than those of 150 years later. In several languages the scribes of later time often affect an antiquated form, so that it takes a long and close inspection to see that the writing is really much later than it seems at first sight. A Greek manuscript in the Philadelphia Library is usually taken at first sight to be several centuries older than it is, and for some centuries older than the author himself of the work. For generations it was supposed that the "lapidary" style of Greek inspections was older than the "uncial," but that is now found to be true only as a general proposition. The cursive Greek writing had long been thought to be scarce older than the ninth century A. D., but the potsherds of Egypt, the Rainer papyri from the Fayyûm in Egypt, and some inscriptions on pottery in the Cesnola collection in New York, show that the cursive writing was used almost if not quite as long ago as the date of our oldest uncial manuscripts. Almost, but not quite, the same may be said of the more cursive forms of Syriac writing, as compared with the ancient Estranghela alphabet. And, on the other hand, a Syriac manuscript of the twelfth century, in the library of the Union Theological Seminary, New York, contains a treatise which the scribe begins in imitation of the oldest Estranghela writing, but gradually forgets himself, and finishes in his own contemporary Nestorian. Among Latin manuscripts, the famous Codex Amiatinus, at Florence, after having been long esteemed by the best judges as the work of an Italian scribe, then of a Swiss or German, has been demonstrated to have been written in England. As was said by Bentley (1662–1742), "it is not every one knoweth the age of a manuscript" ; but now we have better helps for the diligent. The discoveries in the Fayyûm of so many Greek, Latin, Syriac, Arabic, and other manuscripts, with data to fix their age, most of which are in Vienna, but some in the British Museum, now furnish a wealth of material for students of the original, and more and more continually for the students of facsimiles published—far better data than have been accessible before. The discovery and bringing to England of the library of the Nitrian convent of S. Maria Deipara made Syriac palæography a rather more certain science than that of the Greek or Latin ; although the general age and nationality of the Latin scribes had been pretty well known, and manuscripts of the Latin Bible and its parts are more numerous than any other class of ancient manuscripts.

In general, the most ancient alphabetic writing was made from right to left ; then boustrophedon, and then from left to right. The most ancient syllabic writing, on the other hand, generally reads from left to right, though there are exceptions. It is claimed by high authorities that the scribes of the Syriac (which reads from right to left) wrote perpendicularly, holding the sheet sidewise ; but it is doubtful whether that method was more than sporadic. With respect to writing materials—the stylus for wax tablets, palm-leaves, and lead, the reed pen for papyrus, parchment, leather, and cotton paper, the brush for illumination and for writing like the Chinese—such particulars belong rather to the making of books. But it is proved that the Syrians sometimes, if not often, used the quill. See ALPHABET, INSCRIPTIONS, and PALÆOGRAPHY. ISAAC H. HALL.

Writing-machines : all contrivances for recording, either for mechanical purposes or for preserving language written or spoken, as well as to aid in writing. Of the former class are all the various means for permanently recording the pressure of steam, the force and direction of the wind, meteorological phenomena, the investigations of the astronomer, etc. Examples of this class are the steam-engine

indicator, the meteorograph, and the delicate recording apparatus now used in large observatories. In the second class are what are termed TYPEWRITERS (*q. v.*). To this class belong the marking, recording, and printing devices described in the article TELEGRAPH. (See also TELAUTOGRAPH.) Several machines have been invented for the use of the blind, among which is Johnson's, which enables a blind person to impress characters in rows and lines so as to be read by the sense of touch.

Attempts have been made to record the spoken word by automatic means, as in the PHONAUTOGRAPH and PHONOGRAPH (*qq. v.*). One of these is the machine invented by M. H. Huppinger, a Frenchman, which is about the size of the hand, and is put in connection with the vocal organs, recording their movements on a moving band of paper in dots and dashes. The person using it repeats the words of a speaker after him inaudibly, and this lip-language is afterward written out.

A stenographic machine has been invented in France which has a keyboard of twelve black and twelve white keys on a plane, in three groups of four black and four white keys. The keys produce indications in ink on a roll of paper, the black keys giving long marks and the white ones simple dots. These keys may be simultaneously struck, so that the combinations may give several letters or words for every movement of the operator's fingers. It is said that six months' practice will enable one to follow a speaker. A similar machine, the steno-phonotype reporter, was invented by J. C. Zachos, of New York. In this the types are placed on twelve shuttle-bars, two or more of which may be simultaneously placed in position. The impression is given by a plunger or platen common to all the bars.

Wroblewski, ZYGMUNT F.: See the Appendix.

Wryneck [named from its habit of twisting the neck in a serpentine manner]: any bird of the genus *Iynx*, forming the sub-family *Iynginæ*. The wrynecks are closely related to the woodpeckers, from which they differ principally in the soft tail-feathers and mottled buff, brown, and gray plumage. The group is confined to Europe, Asia, and Africa, the best-known species being *Iynx torquilla*, a form common to all three countries, though occurring in Europe only as a migrant. It is easily tamed. It lives mostly on ants and caterpillars. F. A. L.

Wulf'enite: mineral *molybdate of lead*, O_4MoPb, named after the mineralogist Wülfen, who first distinguished the mineral in 1781 at Carinthian localities, where it had been mistaken by Klaproth for calcium tungstate; called also *yellow lead ore*. It occurs in tetragonal crystals, also granular massive; has about the hardness of calcite; yellow or orange in color, sometimes red (containing then *vanadic acid*); also green and brown; and has a resinous to adamantine luster. It is found in several American localities, notably in very fine crystals at Phœnixville, Pa.

Wulfstan, or **Wolstan**: prelate; b. in Worcestershire, England, about 1007; educated in the monastic school at Evesham, and afterward in the seminary at Peterborough; became a monk and prior of the monastery at Worcester; was appointed Bishop of Worcester in 1062, on the promotion of Aldred to the archbishopric of York; offered a vigorous resistance to the efforts of that prelate and of his successor to appropriate the estates of the see of Worcester; paid successful court to William the Conqueror; had the diocese of Worcester transferred to the jurisdiction of the Archbishop of Canterbury; enjoyed the favor of William Rufus; defended the city of Worcester against the rebels led by Roger de Montgomery, and rebuilt Worcester Cathedral. He was the last of the Anglo-Saxon prelates. D. at Worcester in 1095. There are two accounts of him by William of Malmesbury—one in his work, *De Gestis Pontificum*, the other a separate *Life* in 3 books, printed in Wharton's *Anglia Sacra* (2 vols., 1691). He has been supposed, though not on sufficient evidence, to be the author of the concluding portion (from 1034) of the *Anglo-Saxon Chronicle*.—Another WULFSTAN, b. about 950, Archbishop of York in 1003, was the supposed author of the Saxon *Sermones Lupi Episcopi*, published at Oxford by Elstob in 1701.

Wurmser, *voorm'ser*, DAGOBERT SIEGMUND, Count von: soldier; b. at Strassburg, in Alsace, May 7, 1724; entered first the French, afterward the Austrian army; fought in the Seven Years' war and the Bavarian succession war, and was afterward appointed military commander in Galicia, and made a general of cavalry (1787). In the wars between Austria and the French republic he achieved some successes on the Rhine, and in 1796 he was sent to Italy with re-enforcements to supersede Beaulieu as commander-in-chief. Advancing from Trent toward Mantua, which was besieged by Bonaparte, he marched his army in two columns, one on each side of the Lago di Garda, but Bonaparte at once raised the siege, fell with his whole force on the western column at Lonato, and beat it back into the Tyrol, and then attacked the other under Wurmser himself, defeated him at Castiglione Aug. 5, and compelled him to retreat into the Tyrol. At the head of a new re-enforcement he advanced toward Mantua a second time, through the valley of the Brenta, but Bonaparte, who in the meantime had penetrated into the Tyrol, now took him in the rear, beat him at Roveredo Sept. 4, Bassano Sept. 8, and under the walls of Mantua Sept. 13, and shut him up in the fortress. Alvinczy, who was sent to his rescue, was defeated at Arcola Nov. 15, and Rivoli Jan. 14, 1797, and on Feb. 2 Wurmser capitulated. Retiring to Vienna, he was appointed military commander of Hungary, but died before entering his new position Aug. 22, 1797.

Würtemberg (official German spelling **Württemberg**, *vürt'tem-bärch*): kingdom in the southwest part of the German empire; third in area, fourth in population; area, 7,529 sq. miles. It is bounded on the N., W., and S. by Bavaria and Baden, on the E. by Bavaria, and is separated from Switzerland by Lake Constance on its southern frontier. It shuts in six small enclaves of Hohenzollern and Baden, while it owns seven exclaves within these two states and Hessen. The larger part of it belongs to the western South German table-land, traversed by the Schwarzwald (Black Forest) and the Suabian Jura, or the Rauhe Alp; the rest is rather hilly than mountainous. The average elevation is 1,640 feet; the lowest point is situated 437 feet above the level of the sea. The country is well watered. A minor part (30 per cent.) of it belongs to the basin of the Danube; the rest (70 per cent.) to that of the Rhine. The Danube traverses the southern part of the country for a distance of 65 miles, and receives the Iller above Ulm. The Neckar, which rises in the southeastern part of the country, where the Schwarzwald and the Rauhe Alp meet, flows northward to the Rhine for a distance of 186 miles. The Tauber, a tributary of the Main, flows through the northern part of the country. All these, and some minor streams, are navigable. Of the artificial waterways, the Wilhelms Canal is the most important, making the Neckar navigable from Cannstadt to Heilbronn. Lakes are numerous. The climate in the Black Forest is severe but healthful; in the other parts of the country moderate and invigorating. The soil is, on the whole, good and well cultivated; in Middle and Lower Suabia are the most fertile districts. Only 4 per cent. is untillable ground; 45 per cent. is arable soil and garden-land; vineyards, 1; meadows and pasture, 19; forests, 31 per cent.

Industries.—Agriculture is flourishing. Of cereals, spelt, oats, maize, rape, rye, wheat, hemp, and flax are raised in abundance, together with leguminous plants and tobacco (13,360 cwt. annually), hops, chicory, etc. The garden, fruit, and vine cultivation is famous. Cattle-breeding is extensively carried on; there are about 100,000 horses, 1,000,000 horned cattle, the exportation of which to France and Switzerland is considerable, 550,000 sheep, 292,000 swine, 55,000 goats, and 120,000 bee-hives. Several Government stud-farms improve the race of horses. Mining, which is chiefly in the hands of the state administration, is almost confined to the production of iron and salt, the latter in five great Government salt-works. The manufacturing industry, owing to the copious water-power, is important and steadily progressing. Noteworthy are the flax-spinning and weaving establishments; the wool, cotton, linen, and lace manufactures; the silk industry, which is the most considerable in Germany; the paper-factories, producing 58,000 cwt., valued at $1,500,000; the manufactures of iron goods and other metalware, especially represented by the machine-factories of Stuttgart and Esslingen; the tile-works and manufactures of earthenware, glass, and chemicals; the dye-works, the tanneries, the sugar-refineries; the manufactures of tobacco, woodenware, etc. Since Würtemberg joined the German Zollverein, in 1834, commerce has steadily increased; it exports especially cattle, grain, wool, timber, salt, fruits, hops, cloth and woolens, linen, leather and paper, Black Forest clocks, gold and silverware, and chemical products. The imports are less considerable, and consist mostly of coal, cotton, porcelain,

faïence, and drugs. Würtemberg's book-trade ranks next to that of Berlin and Leipzig. The most important commercial places are Heilbronn, Cannstadt, Ulm, Friedrichshafen, Stuttgart, Reutlingen, and Tuttlingen. In 1892 1,054 miles of railway were in operation, all belonging to the state, except 10 miles.

Education.—Education is compulsory, and there is an elementary school for every group of thirty families. The University of Tübingen enjoys a worldwide fame; there are also a Polytechnic Institute, an art school, an architectural school, a music conservatory, a veterinary school at Stuttgart, an agricultural academy at Hohenheim, a military school at Ludwigsburg, 85 real-schools of various grades, 64 Latin schools, 11 gymnasia, and 4 lycea, besides 3 Roman Catholic and 5 Evangelical seminaries and numerous industrial schools, as well as many charitable institutions.

Population.—This belongs in the southern part to the Allemannic, in the central to the Suabian, and in the northeastern part to the Frankish race. There were in 1900 2,165,765 inhabitants. Six towns have each a population exceeding 20,000. According to creed, 69·3 per cent. are Protestants, 29·8 per cent. Roman Catholics, 0·36 per cent. other Christians, 0·57 per cent. Jews.

Government and Finances.—The Government is a constitutional monarchy with 4 votes in the federal council and 17 in the imperial diet. The crown is hereditary, and the female line is not excluded. The constitution dates from Sept. 25, 1819, amended in 1868 and 1874. The representation consists of two chambers. The first chamber, that of the peers (*Standesherren*), has 45 members, of whom 36 are members by birthright, and 9 are chosen for life by the king. The second chamber (*Abgeordnetenhaus*) has 93 members, chosen for six years—13 by the nobility, 6 by the Protestant and 3 by the Roman Catholic clergy, 1 by the university, 7 by the cities, and 63 by the rural communities. For the members of this chamber all men above twenty-five years of age who pay taxes or in any way contribute to the public burdens can vote and are eligible. The troops form under the terms of the convention of 1870 the Thirteenth German Army-corps, consisting of 24,120 men, 4,190 horses, and 64 cannons in peace (1896–97); 69,934 men and 120 cannons on the war footing. For administrative purposes the country is divided into four circles (*Kreise*)—the Neckar, Schwarzwald, Danube, and Jagst. With regard to finances, the budget for the fiscal year 1899–1900 was 81,498,086 marks as revenue, 80,750,167 marks as expenditure. The state debt in 1900 was 483,723,700 marks, of which 448,230,664 marks are railway obligations. The administration of justice is carried on by a supreme court (*Oberlandesgericht*) at Stuttgart and eight courts of first rank (*Landgerichte*).

History.—In ancient times Würtemberg was occupied by the Suevi, a Germanic race. About 84 A. D. it came under Roman authority, and out of the Roman colonies grew up the cities. About the beginning of the third century the Allemanni drove the Romans beyond the Danube and the Rhine, but they in turn were conquered by the Franks under Clovis in the battle of Tolbiacum (Zülpich) in 496. About 900, under the German emperors of the Carlovingian dynasty, the duchy of Suabia was formed. The family of the Counts of Würtemberg first appeared in the eleventh century, and grew very rapidly in power and importance. Eberhard V., surnamed "im Bart" (1457–96), one of the most energetic and illustrious Counts of Würtemberg, was made a duke by Emperor Maximilian I. in 1495. Though Würtemberg tried to remain neutral during the earlier part of the Thirty Years' war, it suffered severely from the opposed armies; in 1633 it entered into an alliance with Sweden against Austria, and was devastated by the imperial troops; of 400,000 people, only 50,000 were left after that disastrous war. A similar fate befell it when Louis XIV. began an unprovoked war and sent Melac to ravage all the country along the Rhine. The destructive invasion of the French (1688–92), followed by the disastrous reign of Duke Eberhard Ludwig and his mistresses (1693–1733) nearly ruined the country, which invoked the intervention of Prussia and England in vain. In 1796 it became involved in a war with France, and was compelled to cede Mömpelgard (Montbéliard), but in 1803 Duke Frederick II. obtained as a compensation the electoral dignity and extensive territories, which were formed into a particular division of the state and called Neu-Würtemberg. On Oct. 5, 1805, an alliance was concluded with Napoleon I., and on Jan. 1, 1806, the elector was made a king by Napoleon, and his territory greatly enlarged. The kingdom became a member of the Rhenish confederacy, and on May 14, 1809, Ulm, Mergentheim, and other cities were added to it, but it had to furnish an army of 16,000 men for the ill-fated campaign to Russia (1812). By the treaty of Fulda (Nov. 2, 1813) Würtemberg broke its alliance with France and joined the other German princes against Napoleon, having all its new and old possessions guaranteed by the allies. King William (1816–64) granted the constitution of Sept. 25, 1819. His successor, Carl, married to a daughter of Nicholai I. of Russia, sided with Austria in the war of 1866, and his army was defeated (July 24) at Tauberbischofsheim. On Aug. 13 peace was concluded with Prussia. Würtemberg paid a war indemnity of 8,000,000 florins, and formed an offensive and defensive alliance with Prussia, agreeing to reorganize its army after the Prussian model. On Nov. 25, 1870, it joined the other German states in the formation of the German empire, and had its important share in the victory over France. Charles I. died without children Oct. 6, 1891, and William II., grandson of Charles's uncle on his father's side, succeeded to the throne.

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Wurtz, *v*ürts, CHARLES ADOLPHE: chemist; b. at Strassburg, Germany, Nov. 26, 1817; studied medicine and chemistry in his native city; settled at Paris in 1843; was appointed Professor of Medical Chemistry at the Institute in 1854, and received in 1865 the biennial prize of 20,000 francs; he was made dean of the faculty of medicine 1866; became Professor of Organic Chemistry at the Sorbonne 1874; was appointed senator 1881; was first secretary of the Chemical Society of Paris, which he aided in founding, was three times its president; was vice-president of the Academy of Sciences 1880, and president 1881; was awarded the Copley medal by the Royal Society of London 1881. Besides contributions to the *Annales de Chimie et Physique* and the *Répertoire de Chimie pure*, of which he was editor from 1858 until it was merged into the *Bulletin* of the Chemical Society, he published *Traité élémentaire de Chimie médicale* (3 vols., 1864–65); *Leçons élémentaires de Chimie moderne* (1866–68); *Dictionnaire de Chimie pure et appliquée* (5 vols., 1868–78; 2 vols. of appendix); *Théorie atomique* (1879); *Traité de Chimie Biologique* (1885). His works translated into English include *Chemical Philosophy according to Modern Theories* (1867); *Theory from the Age of Lavoisier* (1869); and *Elements of Modern Chemistry* (1880). D. in Paris, May 12, 1884. Revised by IRA REMSEN.

Wurtz, HENRY, Ph. D.: chemist; b. at Easton, Pa., June 5, 1828; graduated at Princeton 1848; studied at the Lawrence Scientific School at Cambridge, Mass., and also privately; became in 1850 assistant in charge of the laboratory of the Yale (now Sheffield) Scientific School at New Haven, Conn.; was State chemist of New Jersey 1854–56, being also engaged on the geological survey of that State; was subsequently Professor of Chemistry in Queen's University, Kingston, Canada, professor in the National Medical College at Washington, D. C., 1858–59, and chemical examiner in the U. S. patent-office 1858–61; removed to New York; edited the *American Gas-Light Journal* 1871–75; in 1888 entered the employ of Thomas A. Edison as chemist; has made several important discoveries in chemistry, among which are the use of sodium in the amalgamation of the ores of precious metals, the determination of alkalies in silicates by fusion with chloride of calcium (presented to the American Association 1850), and, above all, the discovery of the geometrical laws of the condensation of chemical molecules, first published in 1876. Prof. Wurtz has published more than sixty scientific papers. He is also the originator of the dynamic theory of metamorphic heat in geology, communicated to the American Association for the Advancement of Science in 1866. Of this, Mallet's theory of vulcanicity is only an extreme case.

Würzburg, *v*ürts'boorch: town of Bavaria; 60 miles S. E. of Frankfort; on the Main, which here is crossed by a splendid stone bridge of eight arches (see map of German Empire, ref. 5–E). It was formerly the capital of the bishopric of Würzburg, which (until 1803, when it was secularized and its territory conferred on the Elector of Bavaria) formed an independent and very wealthy ecclesiastical principality of Germany. The episcopal palace, built in 1720, is one of the most magnificent royal residences of Europe. The cathedral, built in the eleventh century, is an elegant

edifice. The university, with which are connected a magnificent hospital and a library of about 200,000 volumes, enjoys a great reputation, especially for its medical department. It had 1,343 students in 1898–99. Besides its university the city has many other good educational institutions, and manufactures of leather, tobacco, cloth, woolen fabrics, and surgical and mathematical instruments. The vicinity produces very fine wine. Pop. (1895) 68,714.

Wyandot Indians: See IROQUOIAN INDIANS.

Wyandotte': city (incorporated in 1867); Wayne co., Mich.; on the Detroit river, and the Lake Shore and Mich. S., and the Mich. Cent. railways; 12 miles S. of Detroit (for location, see map of Michigan, ref. 8–K). It has a public library, high school, two State banks with combined capital of $100,000, a weekly newspaper, and extensive rolling-mills and blast furnaces, several sawmills, shipyard, large soda-ash works, rope and mat factory, stave and hoop works, trunk-factory, etc. Pop. (1880) 3,631; (1890) 3,817; (1900) 5,183. EDITOR OF "HERALD."

Wyant, ALEXANDER H.: landscape-painter; b. at Port Washington, O., Jan. 11, 1836; pupil of Hans Gude in Carlsruhe; settled in New York; National Academician 1869; member of the Society of American Artists 1878; member of the American Water-color Society; received honorable mention at the Paris Exposition of 1889. His works are notable for unity of effect and good qualities of color. D. in New York, Nov. 29, 1892. W. A. C.

Wyatt, Sir MATTHEW DIGBY, F. S. A.: architect and writer on art; b. at Bowle, Wiltshire, England, in 1820; was associated as secretary with those members of the Society of Arts who originated the project of the Universal Exposition held at London in 1851; superintended the fine arts department and the decorations of the Crystal Palace at Sydenham 1852–54; became surveyor to the East India Company Dec., 1855; was architect to the Council of India; was prominently connected with the British Universal Exposition of 1862; received her Majesty's gold medal for architectural excellence 1866; was knighted Jan. 14, 1869, and was Slade Professor of Fine Arts at Cambridge for the first term of three years, 1869–72. Author, among other works, of *Geometrical Mosaics of the Middle Ages* (1848); *Industrial Arts of the Nineteenth Century* (2 vols., 1851); *Metal-Work and its Artistic Design* (1852); *Notices of Sculpture in Ivory, etc.* (1856); *Art-Treasures in the United Kingdom* (1857); *What Illuminating Was—What it Should Be* (1861); and *An Architect's Note-Book in Spain* (1872). D. in London, May 21, 1877. Revised by RUSSELL STURGIS.

Wyatt, Sir THOMAS: sonneteer and diplomatist; b. at Allington Castle, Kent, in 1503; son of Sir Henry (d. 1538), a prominent friend of Henry VII.; educated both at Oxford and at St. John's College, Cambridge; took his degree 1518; made the tour of Europe; married Eleanor, daughter of Lord Cobham; became a gentleman of the king's bedchamber; gained a high reputation at court by his poems, his skill at arms, in music, and in repartee, and his knowledge of continental languages; and was sent by Henry VIII. on several diplomatic missions. D. at Sherborne, Oct. 11, 1542. He left a considerable number of poems, largely love sonnets in the Italian manner, which were published together with those of his friend the Earl of Surrey 1557, and frequently reprinted. Among recent editions of his *Poems*, those of Gilfillan (1858) and of Robert Bell (1860) are the best. The best edition of his *Complete Works* is that of Rev. Dr. George F. Nott, along with those of Surrey (2 vols., 1815–16), with notes and a glossary.

Revised by H. A. BEERS.

Wyatt, Sir THOMAS, called THE YOUNGER: b. at Allington, Kent, about 1521; married at the age of sixteen; succeeded to his father's titles and estate 1542; led for some time a life of reckless dissipation; raised a body of soldiers at his own expense and took part in the siege of Landrecies 1544; commanded the English forces at Boulogne 1545, and was subsequently second in command there under Surrey, remaining there until that place was surrendered to the French 1550; lived in retirement at Allington until the accession of Mary, when he was involved with the Duke of Suffolk in a conspiracy against her in favor of Lady Jane Grey; assembled a body of Kentish men under pretext of resisting Mary's marriage with Philip II.; marched upon London, but was captured, tried, and condemned to death Mar. 15, behaving with little self-control and implicating the Princess Elizabeth and others in his confessions. He was executed on Tower Hill, Apr. 11, 1554. His ill-judged movement proved fatal to Lady Jane Grey, who had been some months in prison, and was brought to the block a week after the attempt upon the city.

Wych-elm: See WITCH-ELM.

Wycherley, wich'er-lē, WILLIAM: dramatist; eldest son of a Shropshire gentleman of good family; b. at Clive, near Shrewsbury, England, about 1640; educated at Angoulême, France, where he became a Roman Catholic; returned to England 1660; studied at Queen's College, Oxford, where he conformed to the Church of England; produced with success in 1672 his play, *Love in a Wood, or St. James's Park*, which procured him the patronage of the Duchess of Cleveland, who introduced him at court; was favored by the Duke of Buckingham and by the king, who afforded him employment at court; brought out three other plays, *The Gentleman Dancing-Master* (1673), *The Country Wife* (1675), and *The Plain-Dealer* (1677), the last two founded in some degree upon Molière's *L'École des Femmes* and *Le Misanthrope*; married clandestinely, about 1680, the Countess-dowager of Drogheda, who soon died, leaving him her fortune, which, however, was disputed at law by her relatives. Having lost favor at court he was several years a prisoner for debt in the Fleet until after the accession of James II., by whom his debts were paid and a pension of £200 settled upon him; succeeded to his paternal estates soon after, and published dull volumes of *Poems* (1704), corrected by Pope. D. in London, Jan., 1, 1715. His *Posthumous Works* (1728) were published by Theobald, and his collected *Plays* (1712) were edited by Leigh Hunt in 1840, in connection with those of Congreve, Vanbrugh, and Farquhar. Wycherley's comedies were in prose, and were vigorous but very coarse. See Macaulay's *Comic Dramatists of the Restoration*.

Revised by H. A. BEERS.

Wyclif, Wickliffe, or **Wiclif**, sometimes de **Wyclif**, JOHN: reformer; b. at Ipreswel (now Hipswell), near Richmond, Yorkshire, England, probably some years earlier than 1324; was a scholar of Baliol College, Oxford, afterward a fellow, and sometime between 1356 and 1361 master of the college. He is supposed to have published in 1356 his first work, *The Last Age of the Church*, in which he argued that the millennium was past, that the world was then under the reign of Satan and of Antichrist, and that the day of judgment was near at hand; was soon led to identify the papacy with Antichrist; about 1360 vigorously attacked the mendicant orders of preachers, whom he accused of profligacy, of false doctrine, and of undermining the influence of the regular clergy. In 1361 he accepted the college living of Fillingham, in the diocese of Lincoln, but exchanged it for the poorer living of Ludgershall 1369. In 1370 he took his degree of D. D., but he had begun to read lectures on divinity at Oxford about 1363. He was appointed chaplain to King Edward III., and wrote against the papal demand for arrears of tribute from the English crown 1365. In 1374 he was appointed by the crown to the living of Lutterworth. In August of the same year was one of six commissioners sent by Edward III. to Bruges to confer with the papal delegates upon questions of ecclesiastical authority in England; remained abroad nearly two years; was during his absence presented by the king with a prebend in the collegiate church of Westbury, Gloucestershire (Nov., 1375), but refused it. In 1376 his vigorous attacks on the papal pretensions caused great excitement in England, and he was accused of heresy by Archbishop Courtney, and summoned before a convocation of the clergy at St. Paul's, London; was attended thither (Feb. 19, 1377) by the two most powerful subjects of the kingdom, John of Gaunt and Henry Percy, the earl-marshal, whose defense of Wyclif gave rise to a popular tumult in which the Savoy Palace, the residence of the former prince, was attacked; was directly accused of heresy in five bulls issued by Pope Gregory VI. May, 1377, by virtue of which he was cited before a clerical synod at Lambeth early in 1378; was saved from active persecution by the intervention in his behalf of the Princess of Wales, and especially by the breaking out in that year of the great papal schism; was consequently allowed to depart with an admonition to refrain from preaching the obnoxious doctrines. He was not fighting these battles alone; on the contrary, he was supported by the chancellor and many of the officers of Oxford University, and by a great part of the nation; and in order to deepen the impression of the movement he began about this time to send out many disciples, who under the name of poor priests preached his doctrines

in all parts of the kingdom; and further he prepared, with the assistance of his pupils, a version of the entire Bible into English (1382), which was rapidly disseminated among the people. Up to this time his teaching related mainly to the religious life, to the sins of monks, and to the independence of the English people from papal domination, especially pecuniary; but in 1381 he made a more decisive break with the Roman Church, for he lectured at Oxford against transubstantiation. In so doing he braved fiercer opposition and could no longer count upon royal protection. He was condemned by a synod of twelve doctors; was summoned before a clerical convocation at Oxford 1382, when he defended his opinions, presenting two confessions of faith in which they were reaffirmed, but in a conciliatory manner; was debarred by royal command from lecturing further at Oxford; retired to his living at Lutterworth, where he continued preaching and writing controversial and expository treatises until his death, which ensued two days after suffering a stroke of paralysis (Dec. 28) while celebrating mass. D. Dec. 31, 1384. His doctrines had many supporters in England (known as Lollards or Wycliffites) for two generations, and being carried to Bohemia by the members of the suite of Queen Anne, gave rise there to the formidable Hussite movement. His opinions coincided in great part with those of Luther and Calvin, and he is justly called "the morning-star of the Reformation." The Council of Constance, as a preliminary to the martyrdom of John Hus and Jerome of Prague, examined and condemned forty-five articles of the doctrines of Wyclif (May 5, 1415), formally declared him a heretic, and ordered his bones to be removed from consecrated ground and cast upon a dunghill. This sentence was not executed until thirteen years later, when, on the demand of the anti-pope Clement VIII., his remains were burned and the ashes thrown into the Swift, a tributary of the Avon. Wyclif's writings were very numerous, more than 200 pieces being ascribed to him, chiefly brief tracts. Few of them were printed until recently, and many are still unpublished. His translation of the Bible was first edited by Rev. Josiah Forshall and Sir Frederick Madden for the University of Oxford (4 vols., 1850). His *Last Age of the Church* (Dublin, 1840) was edited by James Henthorne Todd, D. D., who also issued his *Apology for Lollard Doctrines* (1842) and his *Three Treatises* (1851). A collection of his English *Tracts and Treatises*, with *Selections and Translations from his Latin Works* (1845), was edited for the Wycliffe Society by Robert Vaughan, D. D., who was the author of the best biography of the Reformer up to that time (2 vols., 1828; new ed. 1853). His *Setect Engtish Works* (including numerous sermons) were edited by Thomas Arnold (3 vols., Oxford, 1869–71); his *English Works, hitherto unprinted*, by F. D. Matthew (London, 1880). In 1882 the Wyclif Society was founded by F. J. Furnivall, to take away the reproach that the most important of Wyclif's Latin writings should still be unprinted. These writings are very numerous, and are found in foreign libraries, particularly in Vienna. The explanation of this anomaly is the dissemination of Wyclif's writings among the Hussites after they had been put under the ban in England. The society issued its first volume in 1884. It was then hoped to present the Latin writings complete in twenty volumes in ten years' time, but the nineteenth volume appeared in 1895, and the end is only in sight. Until the Latin writings are published, no complete study of Wyclif's theology can be made. The best biography of Wyclif is by G. V. Lechler (2 vols., Leipzig, 1873; Eng. trans. of vol. i. London, 2 vols., 1878; new ed. with summary of Lechler's vol. ii., 1884, 1 vol.). A good book is Lewis Sergeant, *John Wyctif* (London and New York, 1893). See also W. W. Shirley, *Catalogue of the Original Works of John Wiclif* (Oxford, 1865). For the connection between Wyclif and Hus, see J. Loserth, *Wiclif und Hus* (Eng. trans., London, 1884). SAMUEL MACAULEY JACKSON.

Wyé: river of England and Wales, a tributary of the Severn. It rises on Plimlimmon, near the head water of the Severn, and flows for 150 miles through or adjoining Montgomery, Radnor, and Brecknock, in Wales, and Hereford, Monmouth, and Gloucester, in England, reaching the Severn below Chepstow. The part dividing Monmouth and Gloucester is famed for its beauty.

Wylie, JAMES AITKEN, LL. D.: clergyman and author; b. at Kirremuir, Forfarshire, Scotland, Aug. 9, 1808; educated at Marischal College, Aberdeen, 1822–25, at the University of St. Andrews 1826, and in Original Secession Hall, Edinburgh 1827–30; was minister of the Original Secession congregation at Dollar 1831–46; associate editor with Hugh Miller of the *Witness*, Edinburgh, 1846–56; editor of the *Free Church Record* 1853–60; professor (of the distinctive principles of the Roman Catholic and Protestant theologies) to the Protestant Institute of Scotland, in Edinburgh, from 1860 till his death there May 1, 1890. He wrote mostly upon the subjects connected with his professorship and on the fulfillment of biblical prophecy. Of his many books may be mentioned *Modern Judea compared with Ancient Prophecy* (London, 1841); *A Journey over the Region of Fulfilted Prophecy* (Edinburgh, 1845; 2d ed. under title *Ruins of Bible Lands*, 1857; 14th ed. 1881); *A Pilgrimage from the Atps to the Tiber, or the Influence of Romanism on Trade, Justice, and Knowledge* (1855); *Wanderings and Musings in the Vatleys of the Waldenses* (1858); *The Ter-Centenary of the Scottish Reformation* (1860); *The Awakening of Italy and the Crisis of Rome* (1866); *The Road to Rome viâ Oxford, or Ritualism identical with Romanism* (1868); *Daybreak in Spain, a Sketch of Spain and its New Reformation* (1870); *The History of Protestantism* (3 vols., 1874–77); *The Jesuits: their Moral Maxims and Plots against Kings, Nations, and Churches* (1881); *History of the Scottish Nation* (2 vols., 1886); *The Papacy* (1889). SAMUEL MACAULEY JACKSON.

Wylie, ROBERT: genre-painter; b. in the Isle of Man in 1839. He was taken to the U. S. when a child, and studied at the Pennsylvania Academy, Philadelphia; he was sent by the trustees of the academy to France to study in 1863. He took up his residence at the little village of Pont-Aven in Brittany, and was the founder of a colony of painters there. He received a second-class medal at the Salon of 1872, and after his death his works were exhibited in Paris, where they attracted much attention. D. at Pont-Aven in 1877. One of his most important works, *Death of a Vendean Chief*, painted in 1876–77, is in the Metropolitan Museum, New York. WILLIAM A. COFFIN.

Wyman, JEFFRIES, M. D.: anatomist; b. at Chelmsford, Mass., Aug. 11, 1814; graduated at Harvard 1833, and at the Harvard Medical School 1837; became demonstrator of anatomy and curator of the Lowell Institute 1839; delivered a course of lectures there in 1840; spent two years studying medicine in the hospitals of Paris and natural history in the Jardin des Plantes; was Professor of Anatomy in the Hampden-Sidney Medical College at Richmond, Va., 1843–47, and thereafter until his death Hersey Professor of Anatomy in Harvard University. He soon began the formation of the Museum of Comparative Anatomy, to the increase of which he devoted most of his energies for many years, making extensive journeys; delivered before the Lowell Institute in 1849 a second course of *Lectures on Comparative Anatomy and Physiotogy* (1849); became Professor of Comparative Anatomy in the Lawrence Scientific School at Cambridge; was successively secretary of the Boston Society of Natural History, its curator in different departments, and its president 1856–70; was president of the American Association for the Advancement of Science 1857; became curator of the Peabody Museum of Archæology at Cambridge 1866, and laid the foundation of its remarkable collections; published over sixty papers in the scientific journals and in the *Transactions* or *Proceedings* of the numerous societies to which he belonged; made the first anatomical investigation of the gorilla, and gave it its scientific name. In conjunction with Dr. Savage he investigated the question of spontaneous generation with great carefulness and impartiality; made curious researches in regard to the action of light and other forms of force in embryology, and especially in teratology; exposed the spuriousness of the famous skeleton called the *Hydrarchus Siltimani*, alleged to be that of an extinct sea-serpent, and discovered in Florida and elsewhere prehistoric human remains in fresh-water shell-heaps. D. at Bethlehem, N. H., Sept. 4, 1874.

Wymore: city; Gage co., Neb.; on the Big Blue river, and the Chi., Burl. and Quin. Railroad; 62 miles S. of Lincoln, the State capital (for location, see map of Nebraska, ref. 10–G). It is an important grain and stock shipping-point, and has three weekly newspapers, and railway-shops and roundhouses. Pop. (1890) 2,420; (1900) 2,626. EDITOR OF "REPORTER."

Wynants, or **Wijnants**, JAN: landscape-painter; b. at Haarlem, Netherlands, somewhere about 1600 or later. He lived at Haarlem until 1660 or 1665, and afterward established himself at Amsterdam, where he is supposed to have died after 1679. Wouverman inserted figures in Wynants's

landscapes while the latter lived at Haarlem; A. van de Velde or Jan Lingelbach while he was at Amsterdam. His works are dated from 1641 to 1679. He is well represented in foreign galleries, especially at Amsterdam, Munich, and St. Petersburg, the National Gallery of London, and in the collections of Sir R. Wallace, Lord Northbrook, and the Earl of Ellesmere. W. J. S.

Wynkin de Worde: See WORDE.

Wynne, EDWARD: b. in England in 1734; became an eminent lawyer, and was author of *Eunomus, or Dialogues concerning the Law and Constitution of England; with an Essay on Dialogue* (4 vols., 1767; 5th ed. 2 vols., 1822). This work was at first published anonymously, and is generally cited as *Eunomus* simply. Some shorter and less known and rare works by him which were privately printed were also published anonymously. D. at Chelsea, near London, in 1784. Revised by F. STURGES ALLEN.

Wyntoun, ANDREW OF: rhyming chronicler; b. in Scotland about the middle of the fourteenth century; became a canon regular of the priory of St. Andrews, and was chosen prior of St. Serf's Inch (or Island), Lochleven, before 1395. D. after 1420. He wrote *The Orygynale Cronykil of Scotland*, in rhyme, five books of which relate to ancient history and geography. The part devoted to Scottish history was first edited, with notes and a glossary, by David Macpherson (London, 2 vols., 1795). See the complete edition by Laing, Historians of Scotland Series (3 vols., 1872–79). Revised by H. A. BEERS.

Wyo'ming [= Amer. Ind. (Del.), liter., Great Plains]: one of the U. S. of North America (Western group); the thirty-first State admitted to the Union; capital, Cheyenne.

Location and Area.—It is situated between lat. 41° and 45° N. and lon. 104° and 111° W.; bounded N. by Montana, E. by South Dakota and Nebraska, S. by Colorado and Utah, W. by Utah, Idaho, and Montana; length from E. to W., 355 miles; width from N. to S., 276 miles; area, 99,015 sq. miles, of which about 315 are water surface.

Physical Features.—The general appearance of the State is mountainous, with valleys, foothills, and rolling plains. The mean elevation is 6,000 feet, extremes ranging from 3,400 to 14,000 feet. The continental divide or main range of the Rocky Mountains enters the State about midway on the southern boundary, and extends in a N. W. direction through the State into Montana and Idaho. Wind River Mountains, snow-capped the year around, and with altitude of from 10,000 to 12,000 feet, are the culminating crest of the main range of the Rocky Mountains in the northwest,

Seal of Wyoming.

and are paralleled on the W. by the Teton and Gros Ventre ranges. The Shoshone Mountains, with a general elevation of from 10,000 to 11,000 feet, lie N. of the Wind River range, and the Big Horn Mountains extend from the middle of the northern boundary S. to nearly the geographical center of the State. The Rattle Snake Mountains, together with the Casper and Seminoe ranges, are S. of the Big Horn range, while the Black Hills, which constitute the eastern foothills of the Rocky Mountains, occupy part of the eastern section, extending from South Dakota in a S. W. direction. The Medicine Bow and Sierra Madre ranges are in the southern part and extend into Colorado. The Sweetwater range lies on the southern side of Sweetwater river. The vast plain between the Sierra Madre Mountains and Green river is designated the "Red Desert." The highest peaks in the State are Fremont's Peak, in the Wind River range, elevation 13,790 feet; Grand Teton Peak, of the Teton range, 13,690 feet; Mt. Sheridan, of the Yellowstone range, 13,691 feet; and Atlantic Peak, of the Wind River range, 12,700 feet. Mt. Washburn, Elk, Laramie Mountains, and Index, Wyoming, and Gros Ventre Peaks all exceed an elevation of 10,000 feet. The most important rivers are the North Platte, rising in Colorado and flowing N. into Wyoming, through the southeastern part of the State and then into Nebraska; Green river, flowing S. in the western part into Utah; Snake river, rising in the southern part of Yellowstone Park and flowing S. E. into Idaho, eventually joining the Columbia; the Yellowstone, Big Horn, and Powder rivers flowing N. into Montana; and the Cheyenne and Belle Fourche, flowing E. into South Dakota. Yellowstone Lake, situated in the YELLOWSTONE NATIONAL PARK (*q. v.*), in the northwestern corner of the State, is the largest body of water in Wyoming, being 22 miles long and 15 wide. Jackson's, Shoshone, Lewis, and Madison Lakes lie S. and S. E. of Yellowstone Lake and N. W. of the Wind River range. Fremont and Boulder Lakes lie near the base of Fremont's Peak, where the Green river, one of the largest tributaries of the Colorado, rises.

Geology.—The earliest geological explorations in Wyoming were made by Prof. F. V. Hayden. The State is an interesting field for geological research. Though not as yet extensively explored, Wyoming has been found to contain Tertiary, Carboniferous, Cretaceous, Eozoic, Silurian, Triassic, Jurassic, Devonian, and Volcanic formations. The mineral deposits include a large percentage of coal, iron, gold, silver, graphite, asbestos, gypsum, bismuth, arsenic, alum, sulphur, copper, and red oxide of iron. Building-stones of high commercial value are also found, comprising sandstone, limestone, granite, and marble. They have not as yet been extensively worked, but at Rawlins, on the line of the Union Pacific Railway, there has been opened a large quarry of superior gray sandstone. North of Cheyenne are shipping quarries of excellent stone, ranging in color from light gray to dark red. Iron ores have been found in every county, but mining is not developed. The largest known deposits are at Hartville, Laramie County, where the ore is found associated in many instances with copper. At Rawlins, Carbon County, deposits of red oxide of iron are mined for use as mineral paint and as flux for the reduction of silver ores. Gold and silver are mined at Atlantic, in the Sweetwater region, in the Seminoe, Sierra Madre, and Big Horn Mountains, and in the Silver Crown district W. of Cheyenne. The total valuation of the gold and silver product in 1899 was $29,717. Soda is found in Carbon, Albany, and Natrona Counties, and is mined principally near Laramie, where the deposit is 12 feet thick. Petroleum has been found in many localities, and recent development has placed Wyoming oils on the market. The most extensive development has been in Fremont and Natrona Counties, where many wells have been bored and plugged, awaiting transportation facilities. Oil from the Salt Creek field, in Natrona County, is refined at and shipped from Casper. It is estimated that Wyoming has 20,000 sq. miles underlain with coal. The first utilization of this product was by the Union Pacific Railway in 1868, when it mined 650 tons at Carbon in a single month. The total production in 1899 was 3,837,392 short tons, valued at $4,742,525, of which 3,584,667 tons were loaded at the mines for shipment. The coal-producing counties, with their production in 1899 are: Sweetwater, 1,158,125 short tons; Carbon, 350,504; Weston, 348,611; Uinta, 230,684; Converse, 65,090; other counties, 93,897. The variety is lignite of a high order, containing from 50 to 55 per cent. of fixed carbon, and being equal to many of the bituminous grades.

Soil and Productions.—The soil of the uplands and plateaus of Wyoming is a light sandy loam, and of the valleys a black loam, in some instances alkaline, but yielding bountifully when reduced by water. About 10,000,000 acres are suitable for agricultural purposes by irrigation, 22,000,000 acres are mountainous, 18,000,000 acres consist of high table-lands, and approximately 30,000,000 acres are covered with grasses and suitable for grazing. The native and cultivated grasses of Wyoming are highly nutritious, and by reason of the dry climate cure naturally, thus retaining their nutritive properties. Below the timber-line, which in Wyoming varies from 9,000 to 11,000 feet, the mountains are covered with a thick growth

WYOMING
MONTANA
IDAHO
UTAH
COLORADO
NEBRASKA
SOUTH DAKOTA
YELLOWSTONE NATIONAL PARK
BIG HORN
SHERIDAN
CROOK
JOHNSON
WESTON
FREMONT
NATRONA
CONVERSE
SWEETWATER
UINTA
LARAMIE
CARBON
ALBANY
CHEYENNE
Cinnabar
Mammoth Hot Sprs.
Mt. Washburn
Sadale Mt.
Mt. Chittenden
Mt. Langford
Mt. Stevenson
Heart Mt.
Yellowstone L.
Shoshone L.
Heart L.
Mt. Sheridan
TIMBER LAND RESERVE
Lovell
Corbett
Otto R.
Basin
Alamo
Warren
Fenton
Meteetse
Sunshine
Two Ocean Pass
Mt. Garfield
Embar
Washakie Needle
Thermopolis
Red Bank
Spring Creek
Hyattville
Bonanza
Shell
Cloud Pk.
Big Horn
Banner
Sheridan
Parkman
Dayton
Bingham
Mikado
Buffalo
Ft. McKinney
Trabing
Mayoworth
Powder River
Wrighter
Little Powder
Moorcroft
Gillette
Riverdale
Hulett
BEAR LODGE RANGE
Warren's Peaks
Carlile
Sundance
Linden
Inyan Kara
Francis
Merino
Cambria
Newcastle
Burlington
Belle Fourche
Jackson L.
Mt. Moran
Mt. Leidy
TETON RANGE
GROSVENTRE RANGE
Mt. Baird
Grosventre Pk.
Union Peak
Fremont's Peak
Ft. Washakie
Phlox Mt.
Lost Cabin
Theresa
Clare
Hat Creek
Crawford
Lusk
Manville
Voorhees
Douglas
Orin Junc.
Raw Hide Buttes
Patrick
Wendover
Fort Laramie
Torrington
Uva
Laramie Peak
Mountain Home
Shirley
Owen
Leo
Medicine Bow
Rock Creek
Chimney Rock
Bordeaux
Chug Water
Little Bear
Goodwin's Ranch
Little Horse Cr.
Cooper's Lake
Iron Mt.
Davis Ranch
Laramie
Walbach
Hillsdale
Egbert
Pine Bluff
Fort Russell
Sherman
Tie Siding
Big Laramie
Cummins
Soda Lakes
Sanders
Hatton
Centennial
Wyoming
Lookout
Elk Mt.
Aurora
Ross
Carbon
Hanna
Edson
Percy
Rawlins
Solon
Ft. Fred Steele
Separation
Creston
Wamsutter
Warm Springs
Saratoga
Swan
Grand Encampment Mt.
Dixon
Bagg's
Slater
Vermillion
Quien Hornel Mt.
Maxon
Washam
Burnt Fork
Hilliard
Aspen
Piedmont
Evanston
Ft. Bridger
Carter
Almy
Church Buttes
Opal
Fossil
Ham's Fork
Cokeville
Paris
Bear L.
Bear R.
Pocatello
McCammon
John Day's L.
Snake or Shoshone
Afton
Mt. Lander
Wyoming Peak
La Barge
Fontenelle
Big Piney
Big Sandy
Dry Sandy
South Pass City
Atlantic City
Newfork
Miners Delight
Lander
Derby
Atlantic Peak
Wind River Peak
North Fork
New York Pk.
Mt. Conreville
Wind River Range
Sweetwater Range
Whiskey Peak
Semmoe Peak
Durbin
Ferris
Seminoe
Rongis
Lamar
Sweetwater
Oil City
Ervay
Casper
Deer Cr.
Strouds
Glenrock
Fetterman
Beaver
Labonte
Downey
Freeland
Bessemer
Mt. Garfield
Black Rock R.
Gooseberry R.
Gray Bull
Stinkingwater R.
Big Horn R.
Wind R.
Bridger's Cr.
Bad Water Cr.
Muddy Cr.
Owl Creek
Wood Cr.
Willow Cr.
Crazy Woman Cr.
Powder R.
Little Powder R.
Clear Fk.
Salt R.
North Fork
Middle Fork
South Fork of Cheyenne R.
Lance Cr.
Beaver Cr.
Platte R.
Laramie R.
Medicine Bow R.
Sweetwater R.
Green R.
Big Sandy R.
Smith's Fk.
La Barge Cr.
New R.
Grosventre Cr.
Grand Canon
Black's Fk.
Haw Fk.
Bryan
Granger
Rock Springs
Green River
Hopkins
Bitter Cr.
Packer's Cr.
Sulphur Cr.
S. Bitter Cr.
Almond
Black Buttes
Bitter Cr.
Scale of Miles
0 5 10 20 30 40 50
County Towns
Longitude West from Greenwich
E 112
F 111
G 110
H 109
I 108
J 107
K 106
L 105
M 104
103
45
44
43
42
41
8
9
10
11
12

of pine, spruce, and hemlock trees of large size, more dense on the western than on the eastern slope; the foothills have some pine, spruce, aspen, walnut, elm, ash, box-elder, and red cedar; and along the rivers and creek bottoms are found two species of cottonwood and thickets of willows. Many hundreds of flowering plants, mosses, and lichens are indigenous to the State.

By the aid of irrigation, abundant crops of tame grasses, such as alfalfa (lucerne), red clover, bluestem, redtop, and timothy are grown. The agricultural productions include wheat, oats, barley, rye, buckwheat, and Indian corn. Potatoes are an important crop, of superior quality, and yielding liberally. Other roots and vegetables are sugar-beets and the ordinary farm products of lower altitudes. Hardy fruits and berries thrive, and in the mountains raspberries, strawberries, currants, gooseberries, choke-berries, and buffalo-berries are native.

The following summary from the U. S. census reports of 1880 and 1890 shows the extent of farming operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms	457	3,125	583·8
Total acreage of farms	124,433	1,830,432	1,371·0
Value of farms, with buildings and fences	$835,895	$14,460,880	1,630·0

* Increase.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1900:

CROPS.	Acreage.	Yield.	Value.
Corn	2,403	81,702 bush.	$49,021
Wheat	20,819	366,414 "	278,475
Oats	18,429	630,272 "	296,228
Potatoes	3,921	388,179 "	263,962
Hay	293,718	493,446 tons	3,602,156
Totals	339,290	.....	$4,489,842

On Jan. 1, 1900, the farm animals comprised 70,813 horses, value $1,354,196; 1,499 mules, value $72,564; 18,104 milch cows, value $734,117; 729,722 oxen and other cattle, value $20,505,914; 2,840,190 sheep, value $9,964,806; and about 15,000 swine, value $100,000; total head, 3,675,328; total value, $32,731,597.

Fauna.—About thirty species of mammals, including the grizzly, black, brown, and cinnamon bear, wolf, coyote, mountain lion, wild cat, wolverene, otter, beaver, porcupine, mink, skunk, little ermine, elk, moose, white and black tailed deer, mountain sheep, cotton-tail and jack-rabbit, squirrel, prairie dog, gopher, and muskrat are found. The buffalo, formerly common in Wyoming, is only found in the Yellowstone National Park, where it is protected. About 125 species of birds, including several birds of prey, many song-birds, and game birds of the duck and grouse family, are also found. Of the fifty or more species of fishes there are mountain trout (which is native in many of the mountain streams), several kinds of suckers, catfish, bass, pickerel, sunfish, pike, etc. For the propagation of food-fishes a State fish-hatchery is maintained at Laramie, and also two branch hatcheries, one at Sheridan and the other at Sundance, in the northern part of the State. There are stringent laws for the protection and propagation of game and fish.

Climate.—The average mean temperature for the year in the State is about 44°, ranging lower in the mountains and higher in the valleys, according to the elevation. The atmosphere is pure and rarefied, and cloudless days predominate. In the southern part of the State high winds sometimes prevail during the spring and autumn, but cyclones and tornadoes are unknown, and thunder-storms infrequent. In Dec., 1894, at Cheyenne, the wind attained a velocity of 72 miles per hour, which was the highest for the year, and the highest ever recorded. The average annual velocity is 11·81 miles per hour. The thermometer during the winter months sometimes records very low temperature, but the dryness of the atmosphere tends to ameliorate the effects of the intense cold, and the storms of winter are not generally more violent and destructive than those of lower altitudes. Occasionally, when accompanied by high winds and low temperature, the air becomes so filled with particles of frost and dry snow as to endanger life; but such storms are unusual and of short duration. Generally speaking, the climate of Wyoming is dry, mild, pleasant and healthful. The following table gives extremes and average of temperature and of rainfall by months for 1894:

MONTHS.	TEMPERATURE.			RAINFALL.		
	Highest.	Lowest.	Average.	Highest.	Lowest.	Total.
January	59° F.	17° F.	25° F.	0·15 in.	Trace.	0·20 in.
February	50	13	20	0·23	0·04 in.	0·72
March	63	4	33	0·36	0·02	0·93
April	73	16	44	0·58	0·01	1·64
May	82	27	54	0·38	Trace.	1·24
June	86	40	61	0·33	0·04 in.	0·64
July	94	46	68	1·14	0·03	3·25
August	89	44	67	1·61	0·05	2·17
September	85	32	56	0·44	0·02	1·23
October	73	21	49	0·16	0·01	0·18
November	68	3	41	0·14	0·01	0·08
December	58	13	28	0·18	0·01	0·70
Annual average.	....	....	45·5	Total		12·98

Divisions.—For administrative purposes the State is divided into thirteen counties.

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Albany	12-K	8,865	13,084	Laramie	8,207
Big Horn	8-H	.....	4,328	.....	.....
Carbon	12-J	6,857	9,589	Rawlins	2,317
Converse	9-L	2,738	3,337	Douglas	734
Crook	8-L	2,338	3,137	Sundance	294
Fremont	10-H	2,463	5,357	Lander	737
Johnson	9-J	2,357	2,361	Buffalo	710
Laramie	12-L	16,777	20,181	Cheyenne	14,087
Natrona	10-J	1,094	1,785	Casper	883
Sheridan	8-J	1,972	5,122	Sheridan	1,559
Sweetwater	12-H	4,941	8,455	Green River	1,361
Uinta	10-F	7,414	12,223	Evanston	2,110
Weston	8-L	2,422	3,203	Newcastle	756
Yellowstone National Park	....	467	369		
Totals	....	60,705	92,531		

* Reference for location of counties, see map of Wyoming.

Principal Cities and Towns, with Population in 1900.—Cheyenne, 14,087; Laramie, 8,207; Rock Springs, 4,363; Rawlins, 2,317; Evanston, 2,110; Sheridan, 1,559; Green River, 1,361; Casper, 883; Newcastle, 756; Lander, 737; Douglas, 734; Buffalo, 710; Carbon, 634.

Population and Races.—In 1870, 9,118; 1880, 20,789; 1890, 60,705 (native, 45,792; foreign, 14,913; male, 39,343; female, 21,362; white, 59,275; colored, 1,430, including 922 persons of African descent). Within the limits of Fremont County is the Shoshone Indian reservation, containing 1,520,000 acres of excellent land. It is occupied by the Shoshone and Arapahoe Indians, numbering about 2,000. The Shoshone Indian agency and Fort Washakie military reservation are located on this tract. Fort D. A. Russell military reservation is 3 miles N. W. of Cheyenne. Federal troops are also stationed at Rock Springs, in Sweetwater County, but other military reservations in Wyoming have been abandoned.

Industries and Business Interests.—The most important industries of Wyoming are coal-mining, stock-raising, and banking. The coal-mining industry is largely controlled by the Union Pacific Railway Company. Probably stock-raising in its various departments absorbs the attention of more of the people than any other industry. In 1890 there were 190 manufacturing establishments, employing 1,144 persons, paying in wages $878,646, using materials that cost $1,084,432, and having an output valued at $2,367,601.

Finance.—The total taxable valuation of property in 1900 was $37,892,303.81; the total tax levy was $853,563.23. The receipts for the biennial fiscal period ending Sept. 30, 1900, were $714,135.21; the expenditure, $625,195.82. The constitution provides that the annual levy for State purposes shall not exceed 4 mills on every dollar, excepting for charitable and educational purposes; and the county levy shall not exceed 12 mills, excepting for State revenue and public debt. The State can not create an indebtedness exceeding 1 per cent. of its assessed valuation, and no county an indebtedness exceeding 2 per cent. of it. The total number of real estate mortgages in 1890 was 3,028, representing $4,767,065, or a *per capita* indebtedness of $82.

Banking.—On Sept. 5, 1900, there were 14 national banks, with combined capital of $885,000, surplus and profits of $217,106.18, and individual deposits of $3,948,412.91; on

June 30, 9 State banks, capital $122,000, surplus and profits $56,389, and deposits $627,381; and 11 private banks, capital $176,868, surplus and profits $29,136, and deposits $1,090,905.

Means of Communication.—Wyoming has no shipping, the rivers and lakes not being navigable, and internal trade is conducted by railways or horse-power. From railway terminals to interior towns a considerable tonnage is transported by means of cattle, mule, or horse equipment. The total railway mileage is 1,157·34 miles, of which the Union Pacific Railway has 533·77, and the Grand Island and Northern, 236·59. The railways are practically without branch lines or feeders.

Churches.—The census of 1890 gave the following statistics of the religious bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic	67	67	7,185	$173,450
Latter-day Saints	8	6	1,336	11,700
Methodist Episcopal	13	11	773	48,700
Protestant Episcopal	16	19	594	.....
Lutheran, General Council	5	..	580	.....
Presb. in the U. S. of America	6	6	364	52,250
Congregational	7	6	339	44,550
Baptist	9	9	262	27,875
Lutheran, General Synod	3	3	141	6,100
African Methodist Episcopal	3	3	139	4,000
Disciples of Christ	2	1	48	.....

Schools.—In 1898 there were 13,042 children enrolled in the public schools, with an average daily attendance of 8,700. There were 338 schools and 536 teachers—102 men and 434 women. The average monthly salaries were: Men, $60.40; women, $42.86. The value of school property was $441,460; revenue for school purposes, $217,395; expenditure, $213,291. A Congregational college is located at Big Horn, Sheridan County, and the State University and Agricultural College, at Laramie, Albany County. The State University is maintained from the proceeds of a State levy, and the Agricultural College is supported from the proceeds of an appropriation by the Federal Government. Public buildings are located in Wyoming by vote of the people, and in compliance with this provision of the constitution an agricultural college has been located at Lander, Fremont County.

Post-offices and Periodicals.—In Jan., 1901, there were 327 post-offices, of which 14 were presidential (2 second-class, 12 third-class) and 313 fourth-class. Of the total offices 91 were money-order offices. There were 39 newspapers and periodicals, 4 daily, 2 semi-weekly, 32 weekly, and 1 monthly.

Charitable, Reformatory, and Penal Institutions.—Wyoming maintains a State penitentiary at Laramie, an Insane Asylum at Evanston, a State Hospital at Rock Springs, and a Soldiers' and Sailors' Home at Cheyenne. The blind, deaf-mute, feeble-minded, and juvenile delinquents of the State are sent to the Colorado institutions for such unfortunates, as the number does not justify special arrangements for their care in Wyoming. The poor farm is at Lander, but is not in operation, and paupers are supported by the several counties. A new penitentiary building was completed at Rawlins in 1898. All of the above institutions are supported by special tax levy, and are under the general control of a State Board of Charities and Reform, consisting of the Governor, Secretary of State, auditor, treasurer, and superintendent of public instruction.

Political Organization.—The legislative department is composed of a State Senate, whose members are elected for four years, and a House of Representatives, whose members are elected for two years. Each county is entitled to at least one member in each body, and additional members are allotted according to population. The Legislature meets on the second Tuesday in January of odd years, and sessions are limited to forty days. The compensation of members, excepting officers, is $5 per day. The elective State officers are the Governor, Secretary of State, auditor, treasurer, and superintendent of public instruction, all elected for four years. Appointive State officers are the attorney-general, engineer, adjutant-general, mine inspector, fish commissioner, examiner, veterinarian, and librarian, whose terms vary from two to six years. All State officers have fixed salaries, and fees received by them go to the State. The courts comprise the Supreme and district courts, and justice sof the peace. The Supreme Court consists of three justices, elected for eight years, the senior member by rotation becoming the chief justice. There are four judicial districts, the judges of which are elected for six years. Justices of the peace are elected for two years. Under the constitution the right of citizens to vote and hold office can not be abridged on account of sex, and male and female citizens enjoy equally all civil, political, and religious rights and privileges. Before voting, electors must have resided in the State one year and within the county sixty days, and be able to read the constitution, unless prevented by physical disability. The Australian ballot system is used.

History.—On July 25, 1868, Congress authorized the segregation of a part of the Territories of Dakota, Utah, and Idaho, and the organization of the territory so segregated into the Territory of Wyoming. The territorial form of government was maintained until July 10, 1890, when Wyoming was admitted into the Union. Probably the oldest white settlement is at Fort Laramie, on the Platte river, in the eastern part of the State, where a fur-trading post was established in 1834, rebuilt by the American Fur Company in 1836, and sold to the U. S. and garrisoned in 1849. It was for years an important base of military operations against the Indians, but is now abandoned. Fort Bridger, probably the second settlement, was established in the southwestern part of the State some time in 1842. Although the early settlers experienced the usual frontier contests with the Indians, in which many lives were sacrificed, there have been no serious outbreaks since the Custer massacre by the Sioux of Dakota in 1876, and the Meeker massacre by the Utes of Colorado in 1878.

GOVERNORS OF WYOMING.

Territorial.		*State.*	
John A. Campbell	1869–75	Francis E. Warren *	1890
John M. Thayer	1875–78	Amos W. Barber	1890–93
John W. Hoyt	1878–82	John E. Osborne	1893–95
William Hale	1882–85	William A. Richards	1895–99
Francis E. Warren	1885–86	De Forest Richards	1899–
George W. Baxter	1886		
Thomas Moonlight	1886–89		
Francis E. Warren	1889–90		

* Elected U. S. Senator while Governor.

AUTHORITIES.—Bancroft, *History of Wyoming*; the reports of Prof. F. V. Hayden, U. S. geologist; Ralph, *Our Great West*; the reports of Gov. Warren, and the annual reports of State officers. CHARLES W. BURDICK.

Wyoming: town (settled in 1837); Stark co., Ill.; on the Burlington Route and the Rock Id. and Peoria railways; 6 miles S. E. of Toulon, 30 miles N. by W. of Peoria (for location, see map of Illinois, ref. 4–D). It has 5 churches, 2 graded schools, 2 flour-mills, 3 grain elevators, a private bank, 2 weekly newspapers, and several large machine-shops, and is principally engaged in mining and agriculture. Pop. (1880) 1,086; (1890) 1,116; (1900) 1,277.

EDITOR OF "POST-HERALD."

Wyoming: village; Springfield town, Hamilton co., O.; on the Cin., Ham. and Dayton Railroad; 12 miles N. by E. of Cincinnati (for location, see map of Ohio, ref. 7–C). It is principally a residential place, has several churches, graded school, and public library (founded in 1882), and does its banking in Cincinnati. Pop. (1890) 1,454; (1900) 1,450.

Wyoming: borough; Luzerne co., Pa.; on the Susquehanna river, and the Del., Lack. and West. Railroad; 3 miles S. W. of Pittston, 5 miles N. by E. of Wilkesbarre, the county-seat (for location, see map of Pennsylvania, ref. 3–I). It takes its name from the valley in which it is situated, and is chiefly notable because of the massacre within its limits. (See WYOMING VALLEY.) It is engaged in farming, mining, and manufacturing; does its banking in Pittston; and has a monument commemorating the massacre about half a mile S. of the actual scene, a public high school, and a weekly newspaper. Pop. (1890) 1,794; (1900) 1,909.

Wyoming, University of: See the Appendix.

Wyoming Valley: a fertile valley in Luzerne co., Pa.; traversed by the north branch of Susquehanna river. It was settled in 1762 by people from Connecticut, which colony claimed this region by virtue of its ancient charter, notwithstanding the protest of the government of Pennsylvania. In the following year the settlers were either driven away or slain by the Delawares, but other Connecticut colonists went there in 1769, and for several years were embroiled in a contest with other citizens, who recognized the government of Pennsylvania. In 1771, the British Government having confirmed the Connecticut claim, peace was restored, but in 1775 a force of Pennsylvanians attacked the settlements

without success. During the Revolutionary war a large number of Tories from New York settled in the valley, which, from its seclusion, could not well be protected from hostile arms. The greater proportion of the able-bodied men were on duty with Gen. Washington when on June 30, 1778, a body of 400 British troops and 700 Seneca Indians, with some Tories, invaded the valley. On July 3 the battle of Wyoming was fought between this force and a body of some 300 settlers, chiefly boys and old men, who were driven into a fort, and after a desperate resistance, in the course of which about two-thirds of their number were killed by the Tories and Indians, not even the prisoners being spared, were forced to capitulate, but the terms of the capitulation were not observed, and the greater part of the inhabitants were soon compelled by the Indians to flee from the valley. In 1782 Congress decided the dispute as to jurisdiction in favor of Pennsylvania; but when the authorities attempted to eject the Connecticut people from the property they had acquired in the valley, they again took up arms, and the contest lasted until 1788, when the Pennsylvania Legislature confirmed the titles of the residents; but for some twenty-five years there was much litigation in regard to the conflicting claims. This long series of contests was known as the "Pennymite wars," the settlers calling their opponents "Pennymites." The valley includes parts of the townships of Pittston, Jenkins, Plains, Wilkesbarre, Hanover, Plymouth, Kingston, and Exeter, but the Connecticut colony occupied a large tract in Luzerne and several other counties. The picture of the massacre of Wyoming given by Campbell in his *Gertrude of Wyoming* is greatly exaggerated in respect to the cruelties practiced by the Indians. Above Kingston, opposite Wilkesbarre, stands a granite obelisk which commemorates the slain in the contest of July 3, 1778. See Charles Miner's *Hist. of Wyoming* (1845); George Peck, *Wyoming, its History and Incidents*, etc. (1858). Revised by F. M. Colby.

Wyss, Johann Rudolf: author; b. at Berne, Switzerland, Mar. 13, 1781; studied philosophy at various German universities; was appointed professor in the academy of his native city in 1806, later chief librarian also. D. there Mar. 31, 1830. He published *Vorlesungen über das höchste Gut* (2 vols., 1811); *Idyllen, Volkssagen, Legenden und Erzählungen aus der Schweiz* (3 vols., 1815–22); and *Reise im Berner Oberland* (1808); edited the series entitled *Alpenrose* (20 vols., 1811–30). His *Der Schweizerische Robinson* (The Swiss Family Robinson, 2 vols., 1812–13), was translated into many languages. Revised by J. Goebel.

Wythe, George: signer of the Declaration of Independence; b. at Elizabeth City, Va., in 1726; educated at William and Mary College; inherited a large fortune by the death of both of his parents before reaching mature age, and led for some time a life of extravagance, but when thirty years of age devoted himself to legal studies; was admitted to the bar 1757; soon became eminent as a lawyer; was chosen to the house of burgesses as the representative of William and Mary College 1758; drew up in 1764 a remonstrance addressed to the British Parliament against the Stamp Act; was elected to the Continental Congress Aug., 1775; signed the Declaration of Independence; was appointed Nov., 1776, along with Jefferson (who had been his pupil), to revise the laws of Virginia; was chosen speaker of the House of Delegates and appointed judge of the high court of chancery 1777; became sole chancellor on the reorganization of that court 1786, filling that post twenty years; was Professor of Law at William and Mary College 1779–89; emancipated his slaves toward the close of his life, and furnished them with the means of subsistence. D. by accidental poisoning at Richmond, June 8, 1806. Author of *Decisions of Cases in Virginia by the High Court of Chancery* (1795; 2d ed., with *Memoir*, by B. B. Minor, 1852).

Wytheville: town (founded in 1835); capital of Wythe co., Va.; on the Norfolk and West. Railroad; 80 miles W. of Roanoke, 131 miles W. of Lynchburg (for location, see map of Virginia, ref. 7–D). It is a popular summer resort, in a lumbering, mining, and stock-raising region, and contains 13 churches, Trinity Hall Female College (Lutheran), Wytheville Seminary (Protestant Episcopal), 2 State banks with combined capital of $150,000, 4 weekly newspapers, and manufactories of woolen goods, iron, and wood work. Pop. (1880) 1,885; (1890) 2,570; (1900) 3,003.

Editor of "Southwest Virginia Enterprise."

Wyttenbach, *vit'ten-baăkh*, Daniel: Greek scholar; b. at Berne, Switzerland, Aug. 7, 1746; studied at Marburg; went thence, in 1768, to Göttingen to enjoy the instruction of Heyne, at that time the most celebrated classical philologian of Germany. Before this Wyttenbach had begun to read through all the Greek authors in chronological order down to the later philosophers and rhetoricians. In 1769 he attracted the attention of the famous Ruhnken by his *Epistola Critica super nonnullis locis Juliani imperatoris*; visited Leyden (1770) to attend the lectures of Valckenaer and Ruhnken. Through their influence he obtained the chair of philosophy and literature at the college of the Remonstrants in Amsterdam; was transferred in 1779 to the Athenæum of that city, and in 1799 was called to Leyden as the successor of Ruhnken. Among his writings are *Præcepta Philosophiæ Logicæ* (1781); *Selecta principum Græciæ Historicorum* (1793); but his great work, upon which he bestowed the labor of nearly thirty years and upon which his enduring fame rests, was his exhaustive critical and exegetical edition of Plutarch's *Moralia* (text, commentary, and index; new ed. in 12 vols., 1834). His *Vita Ruhnkenii* (1799, pp. 240, edited with copious notes by Bergman, 1824) is a biographical masterpiece. His *Opuscula* (2 vols.) were published shortly after his death Jan. 17, 1820. See G. L. Mahne, *Vita D. Wyttenbachi* (1823). Alfred Gudeman.

Wyttenbach, Thomas: Reformer; b. at Biel, canton of Berne, Switzerland, 1472; studied theology at Basel and Tübingen, and was appointed preacher in his native city in 1507. In 1519 he began to preach against the sale of indulgences, the mass, and the celibacy of the priests, and in 1524 he, together with seven other priests from the vicinity, married. Although he had gained many adherents among the citizens, the Roman Catholic party, the council of Berne, and the Bishop of Basel were nevertheless powerful enough to drive him from his office and expose him to poverty and many persecutions. He continued, however, to preach according to his convictions, and two years after his death, which took place in 1526, Biel accepted the Reformation.

Revised by S. M. Jackson.

X

: the twenty-fourth letter of the English alphabet.

Form.—The form is the same as that of the twenty-first letter of the Roman alphabet, representing the twenty-fourth letter of the so-called Western Greek alphabet. In this alphabet it was the first of the signs added to the original body of twenty-three letters, and had the value *ks*. In the Eastern or Ionic alphabet it held the twenty-fifth place, being preceded by *phi*, and had the value *ch*. In form it is probably an old variant of tau (T, +, X), just as the next letter of the Western alphabet Y (*ch*) was a variant of *upsilon*.

Name.—The name *eks* has displaced the earlier *iks* (*ix*) = O. Fr. *ix* = Lat. *ix* (*ex*), on the analogy of *ef*, *el*, *em*, *en*, *es*.

Sound.—Generally a double consonant: (1) *ks*, in *tax*, *axle*, *exile*; (2) *gz* before an accented vowel, as in *examine*, *example*, *exist*, *exhort*; (3) *ksh* (*kš*), as in *anxious*, *luxury*; (4) *gzh* (*gž*), in *luxurious*, *luxuriant*; (5) *z* initially, as in *Xerxes*, *Xenophon*, *xebec*.

Sources.—Chief sources are: (1) Teutonic *hs* < Indo-Europ. *ks*; *ox* < O. Eng. *oxa*: Germ. *ochse*, Sansk. *ukṣan-*; six < O. Eng. *siex*: Germ. *sechs*, Lat. *sex*; *wax* (verb) < O. Eng. *weaxan*: Germ. *wachsen*, Gr. αὐξάνω, Sanskr. *vakṣ-*; *next* < O. Eng. *nēxt*: Germ. *nächst*; *axe* < O. Eng. *œx*: Germ. *axt*, Gr. ἀξίνη; *flax* < O. Eng. *fleax*: Germ. *flachs*. (2) Union of *c* + *s* in English by syncopation: *sexton* < M. Eng. *secrestein*; *proxy* < M. Eng. *prokecye*. (3) Loan-words from Latin: *noxious* (*noxius*), *text* (*textus*), *lax* (*laxus*), *juxtaposition* (*juxta*), *fix* (*fixus*), *extra* (*extra*), *explode*, *exist*, etc. (4) From Greek: *climax*, *calyx*, *exodus*, *larynx*, *onyx*, *elixir* (viâ Arabic), etc. BENJ. IDE WHEELER.

Xalapa: another spelling of JALAPA (*q. v.*).

Xalisco: See JALISCO.

Xanthin, or **Xanthine** [from Gr. ξανθός, yellow]: a name given to the yellow principle contained in flowers, to a yellow coloring-matter found in madder, and to a compound found in some rare urinary calculi, and as a normal constituent of urine in very small quantity. I. R.

Xan'thophyll [Gr. ξανθός, yellow + φύλλον, leaf]: a modified form or product of transformation of *chlorophyll*, the green coloring-matter of leaves. Little is known about it chemically as yet, more than the fact that by some chemical change in the leaf, generally before separation from the tree, the green matter is changed into other compounds, sometimes yellow and sometimes red, this being the first stage of decay, the final product being brown.

Xanthopro'teic Acid [*xanthoproteic* is deriv. of *xanthoprotein*; Gr. ξανθός, yellow + *protein*]: an acid formed by the action of nitric acid on albuminoid substances. When the fingers are wetted with nitric acid they become stained of a deep and indelible yellow, which becomes orange-red on the subsequent application of an alkali. This phenomenon was investigated by Mülder, who found that the action of the nitric acid was upon the *albuminoid* matter of the skin, and he isolated the yellow substance, to which he gave the above name. He attributed to it the composition $C_{34}H_{26}N_4O_{14}$. White of egg and other albuminoid matters give the same compound. The stain produced upon wood by nitric acid is due to a similar compound formed with albuminoid matter in the wood. The indelibility of the stain on the fingers is due to the fact that this substance is soluble only in acids and alkalies so concentrated as to destroy all organized substances, and which hence can not be applied to the skin with safety. Boiling potash solution dissolves xanthoproteic acid with a deep red color; hence the darkening of the stain by alkalies. From this solution xanthoproteates of other bases may be precipitated.

Xanthorham'nine [Gr. ξανθός, yellow + ῥάμνος, buckthorn (whence Mod. Lat. *Rham'nus*)]: a yellow coloring-matter, contained in the ripe Persian or Turkey berries and in Avignon grains. It appears to be formed by the decomposition of *chrysorhamnine* ($C_{23}H_{22}O_{11}$), which is present in the unripe berries. Its extraction is effected by boiling the ground berries with alcohol, allowing the decoction to stand until the various impurities present settle, then allowing the xanthorhamnine to crystallize, and afterward purifying it by recrystallization from alcohol. It is also obtained upon boiling chrysorhamnine with water. It forms yellow crystals, which are easily soluble in water and in alcohol, but do not dissolve in ether. It probably has the composition $C_{23}H_{28}O_{14}$, although, according to some authorities, it is identical with *quercitrine*, $C_{33}H_{30}O_{17}$. When treated with dilute acids, xanthorhamnine yields glucose ($C_6H_{12}O_6$) and *rhamnetine* ($C_{11}H_{10}O_5$). It forms precipitates with several metallic salts, and imparts a yellow color to fabrics mordanted with alumina, and a black color to those mordanted with iron salts. Revised by IRA REMSEN.

Xanthoxylum: a genus of plants of the family RUTACEÆ (*q. v.*) containing the PRICKLY-ASH (*q. v.*). See also SATIN-WOOD.

Xanthus: city of Lycia. See LYCIA.

Xantippe: See SOCRATES.

Xaraes: See CHARAES.

Xauxa: See JAUJA.

Xavier, FRANCISCO, de: See FRANCIS XAVIER.

Xebec [from Span. *jabeque*, *xebeque*, Fr. *chebec*, of doubtful source]: a small, three-masted vessel, carrying lateen and also sometimes square sails. It is sharp fore and aft, has low sides and a high, cambered deck. The xebec is a fast sailer and was the favorite vessel of the Mediterranean pirates. It is still employed in commerce along the southern and eastern Mediterranean. E. A. G.

Xenia, zee'ni-ăa: city (incorporated in 1808); capital of Greene co., O.; on the Shawnee creek, and the Cin., Ham. and Dayton, and the Pitts., Cin., Chi. and St. L. railways; 55 miles S. W. of Columbus, 65 miles N. E. of Cincinnati (for location, see map of Ohio, ref. 6–D). It is in the Miami valley, 3 miles from Little Miami river and 12 from Big Miami river: is laid out with broad macadamized streets; and is principally engaged in the manufacture of cordage, paper, shoes, pumps, carriages, machinery, and powder, and in marble and granite work. In the center of the city is a park containing the county court-house, and opposite the park is the municipal building. There are 16 churches, of which the Baptists and Methodists have 4 each, the United Presbyterians 3, and the Episcopal Church, the German Reformed, the Lutheran, the Presbyterian, and the Roman Catholic 1 each; 6 public-school buildings, a business college, and a parochial school. A city workhouse and the county jail are within the corporate limits, and about 2 miles from the city is a county infirmary with a large farm. In 1900 the city receipts were $97,961.27; expenditures $56,099.13; the net debt was $169,523; and the property valuation, $3,893,194. It has 5 hotels, 2 national banks with combined capital of $200,000, a monthly, 4 weekly, and 1 daily periodicals. It is the seat of the Ohio Soldiers' and Sailors' Orphans Home, which has 917 children, 31 teachers, and 39 matrons; and of the United Presbyterian Theological Seminary, which has an endowment of $119,000, and (1901) 4 professors and 19 students. In the suburbs is Wilberforce University, a coeducational institution for colored students, which has an endowment of $128,000, literary, scientific, theological, law, and industrial departments, a training-school for nurses, and (1894) 18 professors, 250 students, and 5,500 volumes in its libraries. Pop. (1880) 7,026; (1890) 7,301; (1900) 8,696.

Xenocrates, ze-nok'răa-tēez (in Gr. Ξενοκράτης): philosopher; b. at Chalcedon in 396 B. C.; became a pupil of Plato, and gained his favor by his earnestness and energy, though the master was well aware of his slowness of comprehension and lack of elegance in manners. He accompanied Plato to Syracuse, and went after his death, together with Aristotle, to Asia Minor. Afterward he returned to Athens, and succeeded Speusippus as chief of the Academy (in 339 B. C.), which position he occupied till his death, 314

B. C. He was highly respected by the Athenians for the integrity of his character, and was repeatedly sent as an ambassador to foreign princes—Philip of Maeedon, Antipater, etc. Aristotle respected him for his insight and knowledge, but of his works none has come down to us.—To be distinguished from him is XENOCRATES the physician, a native of Aphrodisias in Cilicia. A little essay by him, Περὶ τῆς ἀπὸ τῶν Ἐνύδρων Τροφῆς (*De Alimento ex Aquatilibus*), gives an interesting aceount of the state of natural history at that time. It has been edited by De Ancora (1794), by Franz (1774), by Coray (1814), by Matthäi (1808), and by Ideler in his *Physici et Medici Græci minores* (1841). Revised by J. R. S. STERRETT.

Xenon: See the Appendix.

Xenophanes (zen-of′ăn-ēez) **of Colophon**: founder of the Eleatic school of philosophy; flourished in the seeond half of the sixth century B. C., and brought to Elea (Velia), in Lower Italy, his philosophic doctrines and his poetic art. His epic poems have for their themes *The Founding of Colophon* and the *Colonization of Elea*, but his reputation rested on his didactic poem *On Nature* (Περὶ φύσεως), and on his *Satires* (Σίλλοι), in which he attacked the doctrines of other philosophers and poets. He was a zealous upholder of monotheism, and accused Homer and Hesiod of ascribing to the gods actions that were a shame to men. The fragments of his elegies show a high moral standard, and have the true poetic ring. They are contained in Bergk's *Græci Poetæ Lyrici*. For his philosophy, see ELEATIC SCHOOL. B. L. GILDERSLEEVE.

Xen′ophon: Greek historian and moralist; the son of Gryllus, an Athenian of wealth and position; b., according to one account, in 444 B. C., according to another and more probable reckoning about ten years later. Early in life Xenophon was attracted by Socrates, and remained to the last an enthusiastic adherent of the great teacher. But the fascination of the master yielded to the seductions of a military career, and Xenophon took service under Cyrus the Younger in the campaign against his brother Artaxerxes. When Cyrus fell in the battle of Cunaxa, 401, and the Greek generals were assassinated, Xenophon conducted, or intimates that he virtually conducted, the retreat of the Ten Thousand through the enemy's country to the Black Sea, and thence to the Hellespont. This was a military performance that Isocrates chose to represent as a mere promenade, that, according to Xenophon, was an achievement that demanded rare skill, rare tact, readiness of resource, and every phase of fortitude and bravery. Unfortunately, as to Xenophon's part in this famous feat we have no testimony except the historian's own plausible narrative.

The survivors of the expedition joined the army of the Lacedæmonians, who were at that time engaged in operations against the Persians; and Xenophon himself took service with the enemies of his country, and fought at Coroneia (394) against the Thebans, who were allies of Athens. As a natural consequence he was found guilty of high treason, and his property confiscated. The Lacedæmonians indemnified him for the loss of his possessions by presenting him with an estate near Scillus, in Elis, where he lived the life of a country gentleman until he was dislodged after the battle of Leuctra in 371, and was forced to take refuge in Corinth. A turn in politics having united Athens and Sparta against Thebes, Xenophon was recalled from banishment, and of his two sons who had entered the Athenian cavalry, the elder, Gryllus, died a soldier's death at Mantinea (362). A few years later Xenophon died at Corinth.

Apart from his lack of patriotism, Xenophon united in his person many of the best elements of a Greek gentleman (καλὸς κἀγαθός). As a writer, he was held up to subsequent generations as the model of a simple style, and was called "The Attic Bee," by reason of the sweetness of his Atticism. Modern scholarship has made many deductions from the antique estimate, and closer criticism has shown that in the long absence from Attica the *condottiere* Xenophon had lost much of the purity of Attic speech. His thesaurus includes poetical and dialectical words, and his syntax is not always constructed on Attic lines, and these faults, which enhance the human interest of Xenophon's style, have served to bring him into increasing disrepute with exacting Atticists.

The following works make up the body of Xenophon's authorship: The *Anabasis of Cyrus* (Κύρου ἀνάβασις), in seven books, deals with the expedition, the "going up" of Cyrus the Younger against the Great King, and the subsequent retreat of the Ten Thousand. It is the most famous military narrative in literature. *The Cyropædia* (Κύρου παιδεία) in eight books, is an historical romance, in which the author has undertaken to incorporate many of his notions about education and administration. Cyrus the Elder, who is the hero of the story, is an ideal, and the picture is drawn without much regard to historical accuracy. The close of the eighth book, depicting the decline of the Persians, in any case an afterthought, is commonly deemed spurious. The *Hellenica* (Ἑλληνικά), in seven books, takes up the history of Greece from 411, where the narrative of Thucydides stops, and carries it on to the battle of Mantinea in 362. The earlier books, i. and ii., seem to have been intended simply as a continuation of Thucydides. The latter part shows more life and movement, but here also there is a certain diversity of style, and critics have been busy in detecting tokens of different periods and different hands. In the *Agesilaus* (Ἀγησίλαος), an encomium of the great Spartan *condottiere*, whole sections of the *Hellenica* have been incorporated, and the genuineness of the work has been seriously questioned. *Hiero* (Ἱέρων), a dialogue between Hiero and Simonides, is intended as a lesson on the miseries of a tyrant's life. The *Memorabilia*, or *Memoirs of Socrates*, in four books (Ἀπομνημονεύματα Σωκράτους), is the work to which Xenophon owes his name as a philosopher. In it he speaks in his own person, and repels the various charges brought by the Sophists against his master, whose character is unfolded in a series of dialogues. It is not unlikely that in one sense he may be truer to the historical Socrates than was Plato, but the deeper significance of the great teacher was not comprehended by the practical unphilosophic soul of Xenophon. The *Symposium* (Συμπόσιον) is a sequel of the *Memorabilia*, and exhibits Socrates in the joyous environment of a banquet. The piece has an interest, has a grace of its own, but it has nothing of the depth, or the poetry, or the ideality of the Platonic *Banquet*. Which preceded is still a moot point, and will probably always be. The *Œconomicus* (Οἰκονομικός) is also, as it were, another book of the *Memorabilia*, and records in the form of a dialogue the views of Socrates on household economy and agriculture. In this work the figure of Socrates merely serves the purpose of ventilating the views of Xenophon himself. The *Apology* (*Defense*) *of Socrates* (Ἀπολογία Σωκράτους) is a poor thing, and is commonly considered a late fabrication. The *Lacedæmonian Constitution* (Λακεδαιμονίων πολιτεία) is designed to commend the organization of the Spartan state, and was pronounced spurious even in antiquity. The *Athenian Constitution* (Ἀθηναίων πολιτεία) is clearly by an older hand, and is one of the very earliest pieces of Attic prose extant. It has been attributed to various members of the oligarchical party of the time of the Peloponnesian war. The work *On Revenues* (Πόροι) deals with the finances of Athens. The Xenophontean authorship is not assured. The list of writings attributed to Xenophon is completed by the *Hipparchicus*, a manual of instruction for a cavalry commander, a treatise on *Horsemanship* (περὶ ἱππικῆς), and one on *Hunting* (Κυνηγετικός). The genuineness of the last-mentioned tract is much disputed, on account of the unequal style and the excessive floridity of some of its parts. The seven Xenophontean letters are undoubtedly spurious. The bibliography of Xenophon is so vast that only select lists can be given.

EDITIONS.—Of the entire works by Schneider and his associates (6 vols., 1791–1849); the Gotha ed. by Bornemann, Kühner, Breitenbach (4 vols., 1828), by Sauppe (5 vols., 1865). Noteworthy text editions by L. Dindorf, by Schenkl, and by Keller. Among the innumerable editions of the *Anabasis* may be mentioned the German editions of Krüger, Kühner, Hertlein, and Rehdantz, the American editions of Crosby, Goodwin-White, Kelsey-Zenos. Kühner's standard edition of the *Memorabilia* has been translated with additions by Anthon. Holden's English editions of the *Cyropædia*, the *Œconomicus*, and the *Hiero* are highly serviceable for English and American students. The *Hellenica* has been edited by Breitenbach, and also by Büchsenschütz, and the latter edition translated by Manatt and by Bennett in the White-Seymour series. There is an American edition (1894) of the first two books by Blake, based on the best authorities. The *Symposium* has been edited by Hug, who has also made special contributions to the textual criticism of Xenophon. The English translation of Xenophon's works by H. G. Dakyns, in 2 vols. (New York, 1890–93), is destined to supersede all others. Of especial interest is Prof. Morgan's translation of Xenophon's *Art of Horsemanship* (Boston, 1893), with a valuable commentary. Sauppe's *Lexilogus Xenophonteus* (1865) is an indispensable auxiliary in the study of Xenophon. B. L. GILDERSLEEVE.

Xen'otime [from Gr. ξενότιμος, honoring guests or strangers; ξένος, stranger + τιμή, honor]: a native phosphate of yttrium. It crystallizes in octahedrons and prisms; its hardness is between fluor-spar and apatite; density about 4·5. Its color is yellowish brown.

Xeres: See JEREZ DE LA FRONTERA.

Xerez, *k*hā-rāth', FRANCISCO, de: b. at Seville, Spain, about 1500; was secretary to Pizarro during his conquest of Peru, of which he wrote from Caxamarca a narrative addressed to Charles V., *Verdadera Relación de la Conquista del Pirú y de la Provincia del Cuzco llamada la Nueva Castilla, etc.* (Salamanca, 1547), which is sometimes appended to Oviedo's *Natural History of the Indies.* An Italian translation was given by Ramusio, and a French by Ternaux-Compans.

Xerxes, zĕrk'sēz (in Gr. Ξέρξης): King of Persia 486–465 B. C.; b. about 519 B. C.; the oldest son of Darius Hystaspes and Atossa, the daughter of Cyrus; succeeded to the throne on the death of his father in preference to his three elder brothers, sons of Darius by his first wife, a daughter of Gobryas. Herodotus calls him cowardly, cruel, and incompetent, but the facts related of him do not seem to warrant this judgment. In the picture which Herodotus gives of the war between the Greeks and the Persians, the part Xerxes plays is by no means a very prominent one. After suppressing a revolt in Egypt he began his preparations for the war against the Greeks. They lasted for four years, and resulted in the largest military armament the world had ever seen. The Egyptians and Phœnicians furnished the fleet, 1,207 triremes and 3,000 smaller vessels, manned with about 500,000 men; and in order to preserve this fleet from the fate which overtook Mardonius's in 492 B. C. at Mt. Athos, a canal was dug from Strymonic to the Singitic Gulf—a work which cost the labor of several thousand workmen for nearly three years. The army was composed of contingents from all the countries between China and Sahara, and between the Black and the Arabian Sea; forty-six nations were represented in the camp of Xerxes at Cratilla in Cappadocia, each with its own peculiar equipment and method of war. Immense stores of provisions were accumulated at regular stations along the whole line of march from Cratilla to Athens, and a bridge was thrown across the Hellespont from Abydos to Sestos. A storm destroyed the bridge, and Xerxes ordered the engineers who had built it to be put to death. A new bridge was constructed, and for seven days and nights one continuous line of soldiery marched across it. The entire number engaged in the expedition, including the naval force, the women, children, slaves, and other attendants, has been estimated at 5,000,000 persons. The figure has been rejected by some as fabulous. Like an avalanche this host rolled down over Greece. There was some impediment at Thermopylæ, Artemisium, etc., but Xerxes barely heard of it. Athens was burned, and on Sept. 23, 480 B. C., he sat on his throne of gold, raised on a promontory of Mt. Ægaleos, to witness the battle of Salamis. After the loss of this battle the great king fled, panic-stricken, first to Sardis, and thence to Susa, where he buried himself in dissipations, voluptuousness, and court intrigues. In 465 he was assassinated by Artabanus. Revised by J. R. S. STERRETT.

Ximenes de Cisneros, *k*hĕĕ-mā'nās-dā-thĕĕs-nā'rōs, FRANCISCO: primate of Spain; b. at Torrelaguna, New Castile, Spain, in 1436 or 1437; was educated at the University of Salamanca, where he graduated in both civil and canon law 1456; became a priest; went to Rome, where he practiced as an advocate in the consistorial courts 1459–65, acquiring a great reputation for political ability; obtained from the pope a bull nominating him to the first benefice of a specified value which should become vacant in the archbishopric of Toledo; took possession in 1473 of the living of archpriest of Uceda, near his native village, against the will of the Archbishop of Toledo, who regarded the papal bull as a violation of his rights, and on declining to surrender the living was imprisoned six years in Uceda and Santorcaz; was released and given possession of his benefice 1480; exchanged it for a chaplaincy near Sigüenza, where he studied Hebrew and Chaldee, and acted as vicar to the bishop of the diocese; resigned his preferments in the Church and entered the Franciscan convent of San Juan de los Reyes in Toledo 1482; distinguished himself by his austerities; acquired a high reputation for sanctity, and was in great request at the confessional; retired to the secluded mountain-convent of Our Lady of Castañar, where he built with his own hands a cell in which he passed his time in prayer and meditation; was appointed superior of the convent of Sauceda; was appointed confessor to Queen Isabella 1492, retaining his monastic habits and residence; was appointed provincial of his order in Castile 1494, and made his visits of inspection on foot, subsisting on alms; was nominated high chancellor of Castile, Archbishop of Toledo, and primate of Spain 1495; refused for six months to accept that dignity, yielding only to the express commands of the pope; retained the austere simplicity of his former mode of life, dispensing the vast revenues of his see chiefly in charities; effected a vigorous reform among the Spanish clergy; founded the University of Alcalá 1498: insisted that the conquered Moors of Granada should receive Christian baptism during the residence of the court at Granada 1499, thus giving rise to the rebellion in the Alpujarras 1500; began in 1502 the printing at his own expense, at Alcalá de Henares, of the famous Complutensian Polyglot Bible (from *Complutum*, the Latin name of Alcalá); was the director of most of the public acts of Isabella down to her death in 1504; was mediator between Ferdinand and the Archduke Philip in their rival claims upon the regency of Castile; became president of the Castilian council of regency on the death of Philip 1506; was appointed by Pope Julius cardinal and inquisitor-general of Castile 1507; led an expedition against the pirates of Oran on the Barbary coast 1509, securing to Spain an important territorial acquisition; became regent of the kingdom on Ferdinand's death 1516; effected the proclamation of Charles V. against the rival pretensions of the partisans of the insane queen Joanna; reduced the little kingdom of Navarre to quietude; made preparation against the Barbary corsairs; extended the Inquisition throughout the Spanish dominions, but modified its severity; surrendered the regency on the arrival of the young king in Spain in September, and was allowed to retire to his diocese. D. at Roa, on the Douro, Nov. 8, 1517. See his biographies by Gomez de Castro, and by Hefele, *Der Cardinal Ximenes* (Tübingen, 1844; translated into English 1860).

Revised by J. J. KEANE.

Ximenes de Quesada: See QUESADA, GONZALO XIMENEZ, DE.

Xingú, or **Chingú**, *z*hĕĕn-goo': a river of Brazil; one of the principal southern tributaries of the Amazon, which it joins near lon. 52° W. It rises on the plateau of Matto Grosso, has a general southerly course, and is much obstructed by rapids and falls except near its mouth, where it is broad and lake-like. Length over 900 miles; navigable for steamers 110 miles, and above there are long navigable spaces between the rapids. In 1885 von den Steinen explored the whole course of the river, descending it in bark canoes. He found the region about the head waters inhabited by a great number of petty Indian tribes, belonging to nearly every linguistic stock known in Brazil. H. H. S.

Xiphoid Cartilage: See ENSIFORM CARTILAGE.

Xiphosu'ra [Gr. ξίφος, sword + οὐρά, tail]: an order of arthropods, including of living animals only the king crabs or HORSESHOE CRABS (*q. v.*), of which five species only are known. In geological time the group was better developed, *Belinurus prestwichia*, etc., dating from the Carboniferous, *Limulus* from the Cretaceous.

Xisuthrus, zi'soo-thrŭs, or **Xysythrus** (Gr. Ξίσουθρος): the name given by Berosus to the hero of the Deluge in the Babylonian version of the story. It is supposed to come from the Assyrian form *Khasis-adra*. See DELUGE, and Smith's *Chaldæan Account of Genesis* and Lenormant's *The Beginnings of History.* D. G. LYON.

Xorullo: another spelling of JORULLO (*q. v.*).

X-rays: See the Appendix.

Xy'lene, or **Xylol** [from Gr. ξύλον, wood]: one of the series of coal-tar hydrocarbons, a homologue of benzol or benzene: composition C_8H_{10}. There are three isomeric varieties of xylene, all of which occur in coal-tar. All three have been made artificially from BENZENE (*q. v.*) and from TOLUENE (*q. v.*), and they have thus been shown to be dimethyl derivatives of benzene. Xylene is a colorless liquid of little odor, boiling at about 140°. IRA REMSEN.

Xyloid'ine [Gr. ξύλον, wood]: an explosive substance discovered by Braconnet in 1832, prepared by dissolving starch in nitric acid; by the addition of water a white explosive compound is precipitated.

Y

: the twenty-fifth letter of the English alphabet.

Form.—Its form is that of the twenty-second letter of the Roman alphabet. It was simply the Greek letter *upsilon*, ϒ, which was introduced late in the first century B. C. to aid in the transliteration of the numerous Greek loan-words and proper names which were establishing themselves in Latin use. The necessity for the new symbol lay in the peculiar pronunciation of the Greek upsilon (= *ü*, or French *u*). Prior to the adoption of the letter, the sound had been rudely indicated by the Roman V (*u*); thus *cupressus*, *turannus*, *Æguptus*. The letter Y is therefore in its origin the same as V and U; cf. also W.

Name.—The English name *wy* (phonet. *wai*) is the regular modern resultant of a M. Eng. *wī*. This name appears in O. Fr. as *wī* or *guī*, which is undoubtedly of Teutonic origin. It was probably the name assigned to the Greek upsilon when adopted into the Gothic alphabet, and was an approximate imitation of its sound (*ü*) at that time.

Sound.—As a vowel-sign it stands for *ī* (*ai*), as in *my*, *cry*, *type*, *cycle*, *hyphen*, *tyrant*, *hybrid*, *cyclops*, *hyacinth*, or for *ĭ*, as in *hymn*, *syllable*, *syntax*, *myth*, *cynic*, *physics*, *beauty*, *happy*, *physician*. As a consonant, used only at the beginning of a syllable, it represents the consonant of *ĭ*; as in *yet*, *you*, *yolk*.

Source.—As consonant it is limited almost entirely to genuine Teutonic words where it represents: (*a*) O. Eng. ȝ (= *y*) < Teutonic *j* < Indo-Europ. *i̯* or *j*; as in *yoke* < O. Eng. ȝ*eoc*: Germ. *joch*, Lat. *jugum*; *young* < O. Eng. ȝ*eong*: Germ. *jung*, Lat. *juvenis*, Sanskr. *yuvaçá-*; *year* < O. Eng. ȝ*ēar*: Germ. *jahr*, Gr. ὥρα; *ye* < O. Eng. ȝ*ē*: Goth. *jus*, Sanskr. *yúṣman-*; *yea* < O. Eng. ȝ*ēa*: Germ. *ja*, Gr. ἦ; *yon* < O. Eng. ȝ*eon*, cf. Germ. *jener*. (*b*) O. Eng. ȝ, voiced palat. spirant before palatal vowels < Indo-Europ. *gh*; as in *yard* < O. Eng. ȝ*eard*: Germ. *garten*, Lat. *hortus*, Gr. χόρτος; *yellow* < O. Eng. ȝ*eolo*: Germ. *gelb*, Gr. χλωρός: *yield* < O. Eng. ȝ*ieldan*: Germ. *gelten*; *yarn* < O. Eng. ȝ*earn*: Germ. *garn*; *yesterday* < O. Eng. ȝ*iestra*: Germ. *gestern*, Lat. *hesternus*, Gr. χθές.

As a vowel *y* is chiefly used in Greek loan-words to replace upsilon; as in *cycle* (κύκλος), *syntax* (σύνταξις), *type* (τύπος). It also stands in genuine English words for O. Eng. *-iȝ*, as in *twenty* < O. Eng. *twēntiȝ*; *holy* < O. Eng. *hāliȝ*, and as the final component of a diphthong represents O. Eng. ȝ, as in *day* < O. Eng. *dæȝ*, *gray* < O. Eng. ȝ*rāȝ*.

BENJ. IDE WHEELER.

Yachts and Yachting [*yacht* is from O. Dutch *jacht* > Dutch *jagt*, liter., chase, deriv. of *jagen*, hunt, chase]: a yacht is a vessel of any size, propelled by sail, steam, or other motive power, and used exclusively for pleasure purposes. The name was first applied to small vessels of exceptional speed and handiness compared with the war and trading vessels of the day, and thus specially adapted for chasing smugglers and pirates.

The use of large and elegant pleasure craft specially devoted to royalty may be traced back to a very remote period; but yachting in its true sense began no earlier than the seventeenth century, while its establishment as a recognized sport falls within the nineteenth century. Mention is made of a small yacht, called the Rat of Wight, built at Cowes, Isle of Wight, in 1588, and in 1604 a small vessel was built for Henry of Wales; but it is not until the reign of Charles II. that a definite record of the building and use of yachts is found. Through the early part of the seventeenth century the small *jagt* was found in Dutch waters, in model very similar to the Dutch craft of to-day, and the vessel was introduced into England some time prior to 1660. In the diary of Samuel Pepys, secretary to the admiralty, under date of July 15, 1660, is found mention of the king, Charles II., going to inspect a "Dutch pleasure-boat"; and for the next five years the same diary alludes to the building of various small vessels for the king, and of races sailed on the Thames between them and different Dutch craft. The word *yacht*, in its present form and meaning, was prior to that time incorporated into the English language, and at a later date into French, German, and other continental languages.

No hard line of demarkation can be drawn between the small sail-boat or launch and the yacht; while at the other extreme are found the larger class of steam-yachts which differ but little in model and build from passenger steamers, but which are yachts by virtue of their use. The sailing yacht, as distinguished from the larger boats and from canoes, may be defined as a craft of from 20 to 100 feet water-line length, wholly or partly decked, and with standing spars and rigging. The steam, naphtha, or electric yacht, as distinguished from the simple launch, is a craft of from 50 feet water-line length upward, completely decked, and with permanent cabins. The upper limit of length in private steam-yachts is about 250 feet water-line and 1,000 tons displacement.

VARIETIES OF SAILING YACHTS.—Sailing yachts may be divided into three types, according to the shape of the hull: (1) the keel yacht, with a deep body of which the keel is an integral part; (2) the fin-keel, with a very shoal body to which is attached a deep fixed fin, usually a plate of metal, with the ballast in the form of a cigar-shaped mass of lead attached to the lower side; and (3) the centerboard yacht, also with a shoal body, but relying for lateral resistance on a movable plane of wood or metal so pivoted in a vertical plane as to drop through the keel and below the bottom of the vessel. Almost every variety of rig is used on yachts, and although there is not of necessity a close connection between model and rig, it is frequently the case that certain rigs have been so closely associated with certain types of hull that the name of the rig is applied to both, as in the case of the catboat, the sloop, the cutter, and the lugger.

Catboat.—The simplest form of yacht is the centerboard catboat, the hull being wide, shallow, and usually lightly

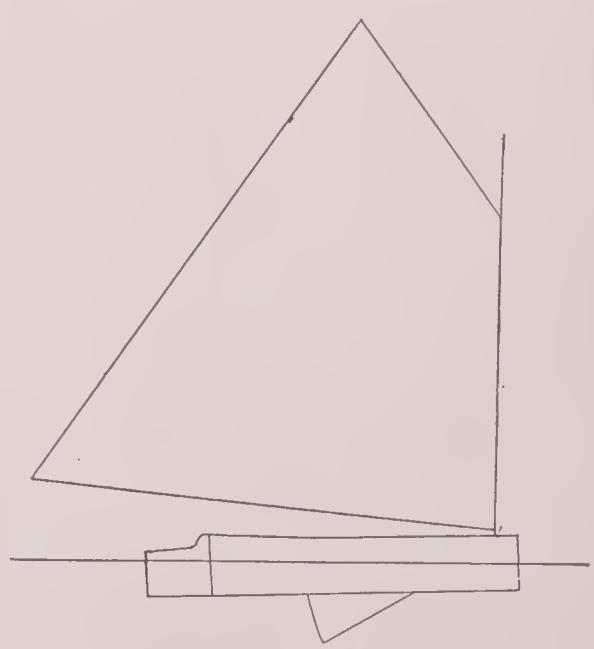


FIG. 1.—American catboat with centerboard.

built, with no overhang at the ends, a wide rectangular rudder hung outside the transom, a large centerboard, and with but one sail set on a gaff and boom, the mast being stepped as far forward as possible. These boats, ranging in length from 12 to 40 feet, are used in all the waters of the U. S. for racing, pleasure-sailing, fishing, and general service; and, though easily capsizable, their light draught and speed make them adaptable to the shoal waters which abound.

Sloop.—The sloop rig, the boom and gaff mainsail with the addition of a large jib, is used on the same type of hull as the cat rig, but on larger as well as the smaller sizes, up to yachts of 70 feet water-line. It is mainly used on the shoal centerboard type, the cutter rig having been adopted with the introduction of the keel yacht. In its simplest

form, with a pole-mast and only a jib and a mainsail, as used on the older racing-boats, it is known as the "jib-and-mainsail" rig, but on decked yachts a topmast, a pole-mast in the smaller, and a housing topmast in the larger, serves to carry a topsail and jib-topsail.

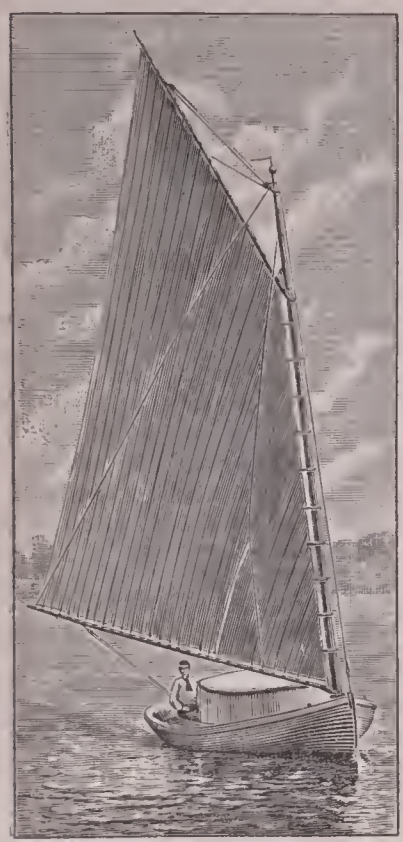


Fig. 2.—Catboat.

The cutter rig is still more complicated than the sloop, in that it has two headsails, a fore staysail in addition to the jib. Since 1885 the cutter rig in a modified form has become almost universal on decked yachts other than schooners in the U. S., being used on both keel and centerboard craft. The advantages of this rig in speed and handiness in all save some of the smaller racing-yachts are generally recognized.

Yawl.—The yawl rig is similar to the sloop or cutter except that it has a short main boom and a second and much smaller mast (stepped just abaft the rudder-head), on which is carried a mizzensail, sometimes a leg-o'-mutton and sometimes a lug sail. The rig is specially adapted for cruising.

Ketch.—The ketch rig is similar to the yawl, but the mainmast is farther forward and the mizzenmast is stepped forward of the rudder-head, giving a much larger mizzen in proportion to the mainsail than in the yawl. This rig was used in the third Valkyrie in her ocean passage in 1895.

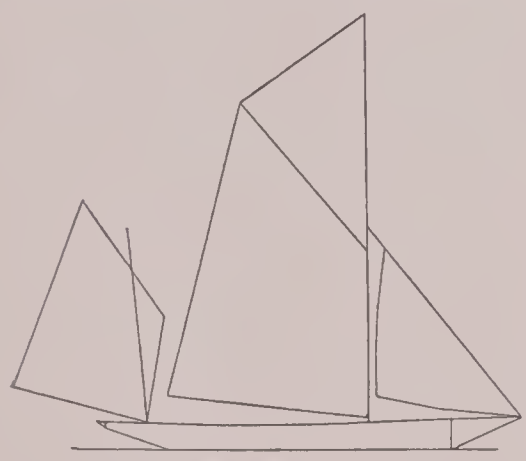


Fig. 3.—Yawl rig with lug mizzen.

Lugger.—The lug rig has a yard on the head of the sail, slung by a single halyard made fast near the middle, instead of a gaff with jaws which slide on the mast. In the true lug the fore end of the yard and the upper fore angle of the sail project forward of the mast. The rig is used on yachts of all types, being the favorite racing rig for the smaller yachts in Great Britain; but it is chiefly associated with the fast smugglers of the early part of the nineteenth century, the lugger having two or three masts with very long yards.

Fig. 4.—Ketch rig.

Sharpie.—The sharpie is a shoal draught vessel, extensively used in the U. S. for oystering as well as for pleasure-sailing. The bottom is flat, the sides slightly flared outward at the deck, the stem straight, and the stern is carried out into a long counter with a round end. The centerboard is long rather than deep, and the rudder is of the balance variety, there being no rudder-post or skeg. The rig is peculiar to the boat and shares the name with it; there are two masts, each long and flexible and carrying a leg-o'-mutton sail extended by a long sprit running across from the mast to the clew, instead of a boom on the foot. The foremast is stepped in the bows and the mainmast just abaft the middle of the boat.

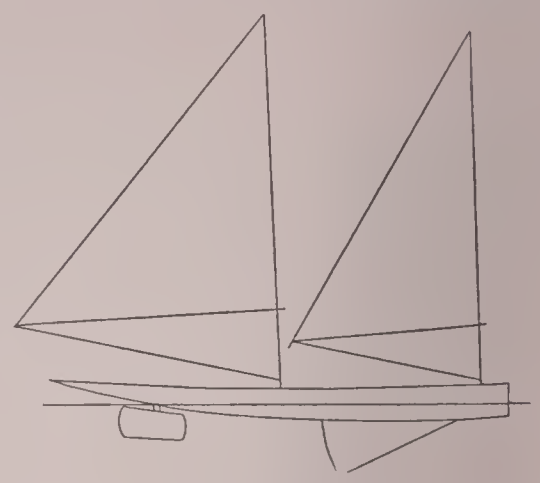


Fig. 5.—Sharpie.

Cat-yawl.—The cat-yawl or double-cat rig, the latter name being peculiar to the Great Lakes of North America, has the larger mast stepped in the bows, as in a catboat, but a mizzen is also carried, as in a yawl, though there is no bowsprit or jib.

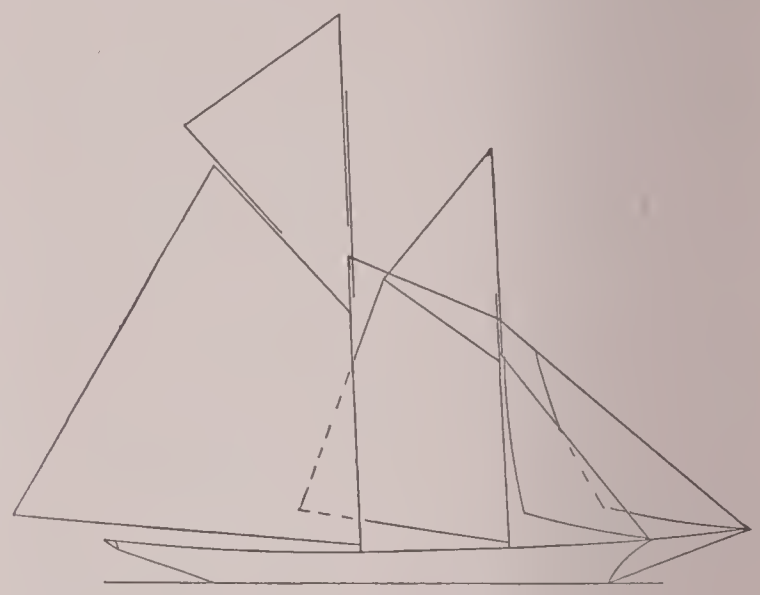


Fig. 6.—Modern schooner rig.

Schooner.—The schooner rig is used on yachts of from 60 feet upward; it has two masts, the fore and main, the latter carrying the larger sail; the bowsprit and head sails are rigged like those of a cutter. The barkentine and brigantine rigs are no longer seen on sailing yachts.

Ice-yacht or Ice-boat.—This is not properly a vessel, but a machine for sailing on ice. It consists of a light framework of wood resting on three large skates or runners, the after one movable and fitted with a tiller for steering. A mast is stepped in the center of the framework, on which one or two sails are carried, the sloop rig being the most common, though the cat rig is sometimes used. Under favorable conditions the boats are capable of very high speed, and they are used throughout the Northern U. S. for racing in winter. The main member

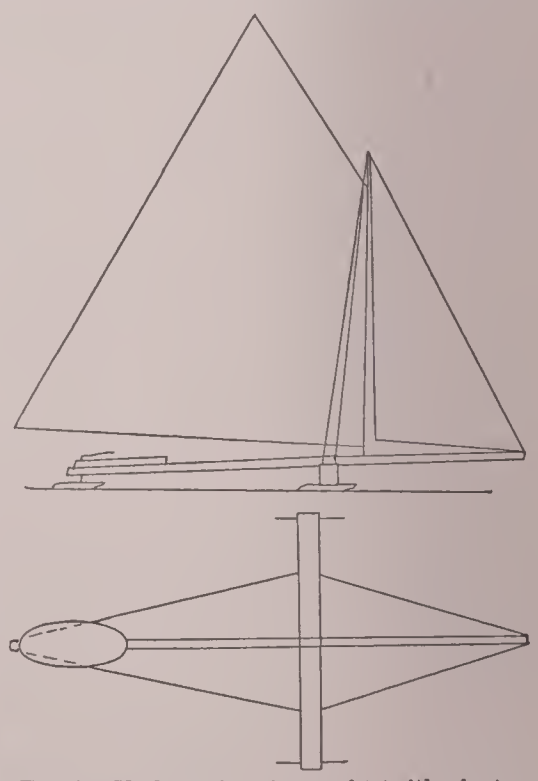


Fig. 7.—Hudson river ice-yacht (with plan).

of the boat is a long stick of timber forming keel and bowsprit in one piece. At right angles to it, and forward of the middle, is the runner plank, on which it rests and is securely bolted. The frame is stiffened by four wire-rope stays which connect the four ends. Under each end of the runner plank is an oak shoe with a a sharp steel runner. The crew, usually two, lie in a small oval box near the after end of the keel.

Fig. 8.—Malay racing "kolek." Crew suspended by lines from masthead.

Early Yachts and Yacht Clubs.—The first yacht club, the "Water Club of the Harbour of Cork" (Ireland), was founded in 1720. The beginning thus made at Cork was not followed by a regular growth of yachting, and the sport had made little progress up to 1812, when the "Yacht Club" was founded at Cowes, Isle of Wight. In 1815 the club was reorganized, and after the prince regent became a member, 1817, it was renamed the "Royal Yacht Club," continuing under this name until 1833, when William IV. altered the name to the "Royal Yacht Squadron," under which it still exists. The yachts of 1800 to 1830 were of all sizes, rigs, and models, following closely after the faster types of fishing-boats, smugglers, and revenue cutters, and rigged as sloops, cutters, yawls, ketches, brigs, and schooners. They were built primarily for cruising, and such racing as they did was merely incidental, all sizes and rigs being classed together, with only the crudest attempts to compensate for difference in size by time allowance. After the peace of 1815, with the waters of the globe thoroughly explored, with the American continent fully colonized, with buccaneering and privateering abolished and the great powers exhausted by a long and expensive series of naval wars, there was little of their old occupation afloat for the descendants of Drake and Frobisher and Raleigh, and the new sport of yachting soon became exceedingly popular. Up to 1840 yacht building and racing were carried on in an irregular and unsystematic manner, but the love of the sport was spreading rapidly in British waters, and a number of clubs were formed.

The first yacht club in the U. S. was the New York Yacht Club, founded in 1844, mainly through the efforts of Col. John C. Stevens and his brother Edwin.

For over a century no attempt was made to allow time to the smaller craft. It was only with the formation of yacht clubs and the general popularity of yacht-racing, subsequent to 1815, that this difference in size was first appreciated and attempts made to measure and allow for it. The first measurement was naturally based on the tonnage of the yachts, as ascertained by the old custom-house rule described in the article Tonnage (*q. v.*), and though modified in various ways from time to time, this same tonnage rule held sway over British yachts down to 1887. This rule did not take into account the actual depth of a vessel, but rated all vessels of the same length and breadth at the same tonnage.

About 1820 the dimensions of a yacht of about 80 tons measurement were 55 feet water-line, 18 feet beam, and 10 feet draught. The model was marked by a long straight keel, but slightly deeper aft than forward, stem-piece and stern-post but slightly raked, a round and full midship section, and a very full bow and disproportionately fine afterbody, the center of buoyancy being placed forward of the mid-length of the water-line.

The first improvements on this model were the deepening of the midship section, giving a larger vessel on the same nominal tonnage an easier form to propel, and a larger and much more effective lateral plane to hold the vessel to windward. The loss on the score of stability, which was one marked result of the change, was met by substituting iron ballast for the stone previously used. The quarter century from 1820 to 1845 was marked by the building of a number of cutters and schooners of this general type, and by a very general interest in yacht-racing.

The Wave-line Theory of Scott Russell.—It was about 1840 that John Scott Russell first pointed out the faults of the bluff bow, the errors of the "cod's-head and mackerel's-tail" theory, then followed by all builders, and the advantages of a new method devised by himself, in which the proportions of length between the fore and after bodies were reversed, the bow being made long and fine and the run shorter and quite full in the water-lines. In 1848 a yacht (the Musquito) was built on the Thames which was remarkable as being constructed of iron in place of wood, and as having a very fine bow and relatively full after-body. In many features of design and construction the Musquito was far ahead of her time, but yachtsmen were slow to appreciate her true merits.

The British Cutter and the Cutter Rig.—The great variety of rigs prevalent in the early days disappeared prior to 1850, leaving two principal rigs, the schooner and the cutter. The schooner rig was found only on the largest yachts, the cutter being the popular rig.

The mast was comparatively short and strongly stayed by several shrouds to a side, a stout forestay, leading from masthead to stemhead, and by masthead runners. The topmast was very long, and so fitted as to be readily housed or even struck entirely and stowed on deck, while the heavy round bowsprit was similarly fitted to house or run in on deck in bad weather. The mainsail was not laced to the boom, but was loose on the foot, confined only at the tack and clew, and there were two headsails—a jib, set on its own luff, so that it could be readily taken in and replaced by a smaller one, the bowsprit being at the same time fidded in, and a fore-staysail running on the forestay.

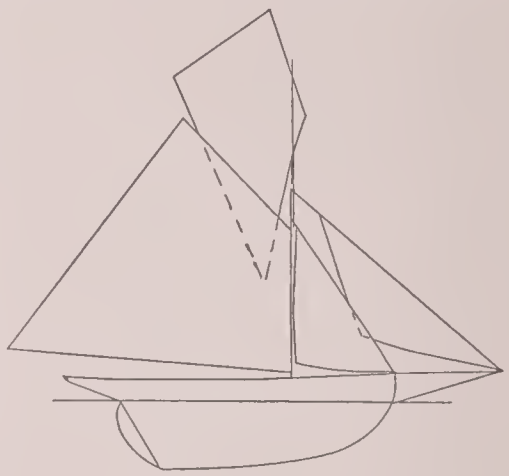


Fig. 9.—British keel yacht with "cutter" rig, 1880.

The cutter rig was essentially a seagoing one, its principles being those of a ship applied in the simplest form. In fair weather a very large spread of sail could be set on the long topmast and bowsprit, and with the big yard-topsail; but this area could be rapidly and conveniently reduced as the wind increased, the topsail taken in, the topmast housed, the bowsprit run in to carry a smaller jib, and the mainsail reefed, until in extreme weather the yacht, with topmast lashed on deck and bowsprit run in, was under only a small storm-trysail set in place of the mainsail, with a diminutive storm-jib or the corner of the staysail.

American Yachting—The Centerboard Type and Sloop Rig.—The establishment of yachting in the U. S. dates from about 1840–45, the prevailing model being very similar to that of the British yachts. The conditions, however, were very different from those governing British yachting. The waters of the North Atlantic coast were essentially different from the English Channel, there being a large available area of calm, landlocked, and readily accessible water about New York, the cradle of the sport, and also about the ports of Long Island Sound. The physical geography of New York harbor was, from 1840 to 1880, one of the

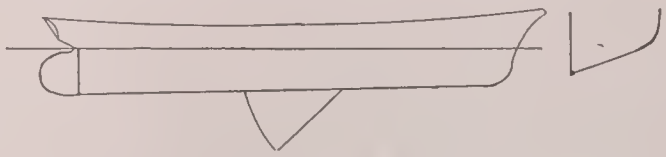


Fig. 10.—American centerboard sloop (1860 to 1880) with midship half-section.

controlling factors in the development of the American yacht.

While in Great Britain the tonnage rule placed a premium on great depth, and local conditions in the form of deep and rough waters also favored it, about New York and Boston, where the rule exerted no influence, the local conditions all tended to produce a shoal vessel.

Though originally of British origin, the centerboard had received little attention from British yachtsmen from the days when its progenitor, the Dutch leeboard, was seen on the *jagts* of the Merry Monarch. It was, however, well known in the U. S. in the coasting and river vessels, and its adoption by yachtsmen came as a matter of course as soon as the fact was appreciated that the very shoal craft could not go to windward with keel alone. Aided by a large centerboard, though at the expense of valuable room in the cabin, it was found possible to build very large and fast craft on a limited draught, the great sloop Maria, built for Commodore John C. Stevens in 1847, having a draught of but 5 ft. 2 in. on a water-line of 92 feet and a beam of 26 ft. 6 in.

The Sloop Rig.—Even before the days of yachting the single-masted rig was found in two different forms—the cutter of the English Channel, already described, a strictly seagoing rig, and the sloop, the product of the local conditions prevailing on the narrow inland waters of Holland.

This rig, brought over by the early Dutch settlers, had been developed to a high degree of perfection in the passenger-packets and freight-boats of the Hudson river and Long Island Sound before the days of yachting, the vessels being also of Dutch model, shoal, wide, and bluff in the bows, first with leeboards and afterward with centerboards. As yachts increased in number subsequent to 1845, a national type was developed, based on the working sloop. Keel boats were few in number; the cutter rig was unknown; there was little difference in model between the largest and the smallest yachts, but those over 50 feet were, as a rule, rigged as schooners, while the smaller ones were sloops.

Fig. 11.—American centerboard yacht with "sloop" rig, 1880.

In the U. S. the fastest yachts of the day were produced by George Steers, the son of an English shipwright, a young builder of remarkable ability, who turned out the finest pilot-boats, yachts, and war-ships of his time. The early Steers yachts and pilot-boats, up to 1846, were all of the "cod's-head" type, but in the pilot-boat Mary Taylor, built in 1848, he made a notable departure from the conventional model in the direction of a fine bow. In 1851, in conjunction with Col. Stevens, he planned a new yacht, the famous America, with the object of visiting England on the occasion of the World's Fair at the Crystal Palace in 1851.

This yacht was a keel schooner of 170 tons, 90 feet water-line, 23 feet beam, and 11 feet draught. Her general construction, rig, and fittings were similar to the pilot-schooners of the day; she had a deep outside keel of oak, and was ballasted by iron stowed on the inner skin. The passage across the Atlantic was safely made, and on Aug. 22, 1851, the America sailed as one of a fleet of 17 yachts—8 schooners and 9 cutters—2 schooners and 1 cutter being larger than she and the rest smaller. The course was around the Isle of Wight, the wind being light and variable. The America came in ahead of all her rivals. The race was sailed without time allowance, and the prize was a silver tankard of the value of 100 guineas. Contrary to a widespread belief, this cup, long known as the "Queen's Cup," was not given by Queen Victoria, but by the Royal Yacht Squadron. The cup, by common consent of the five owners of the America, remained in the possession of Col. Stevens, and was held by him until 1857, when it was dedicated by the five original owners of the yacht to the purposes of a perpetual challenge cup for international competition, being

Fig. 12.—America's first arrival off Cowes, 1851, from painting by Dutton.

first intrusted to the care of the New York Yacht Club to hold under certain specified conditions until won by a foreign challenger.

The victory of the America gave a new impetus to yacht building and racing, and the defeat of their crack yachts set the British yachtsmen at work to imitate her two prominent features—the hollow bow and flat sails. Old yachts were altered and new ones built on both sides of the Atlantic to conform to the new theories.

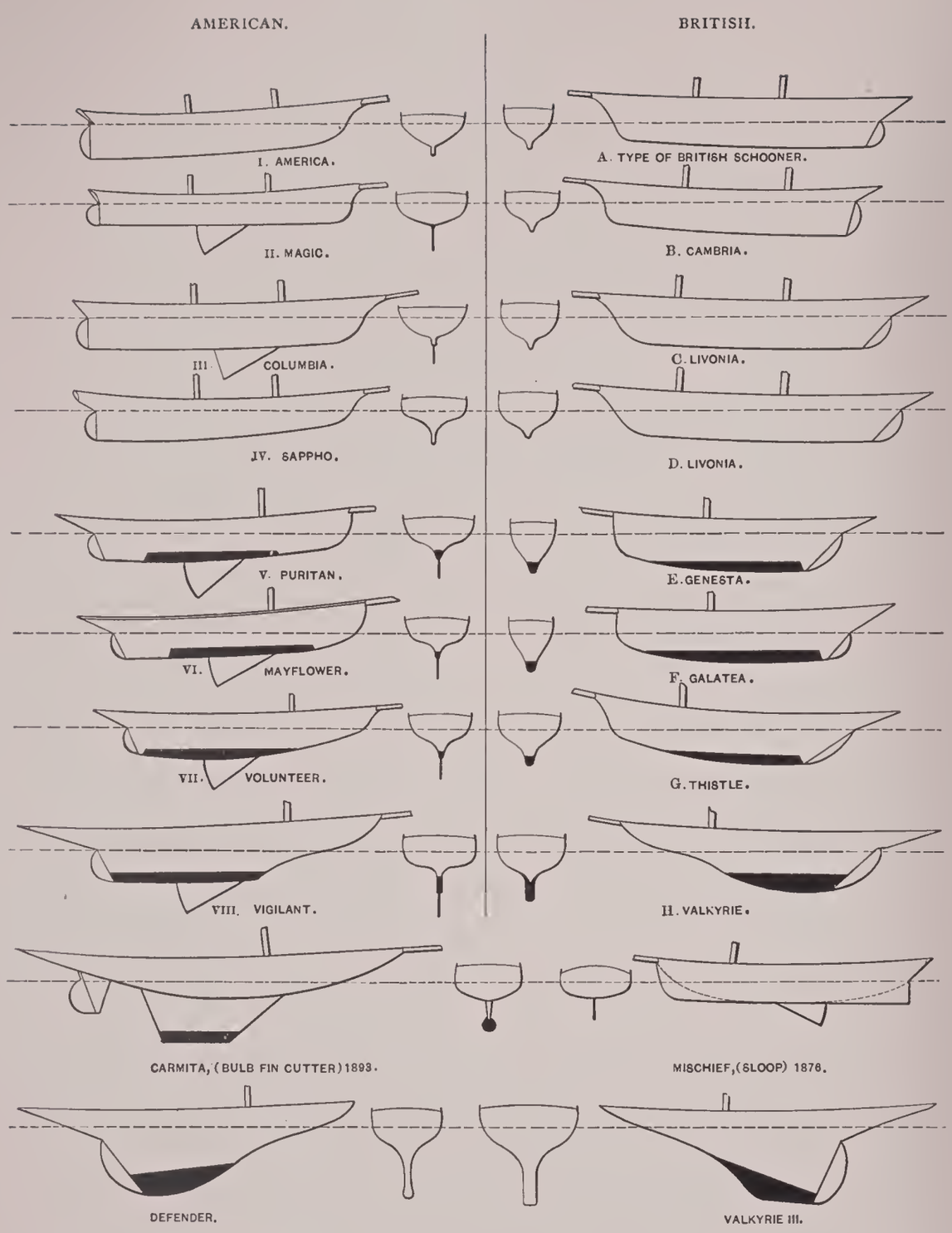
The tonnage rule was never adopted by the yachtsmen of the U. S., but many different rules were tried from 1850 onward, based on displacement, on length taken in various ways, on sail area, and other factors of advantage real or imaginary. From 1850 to 1880 the development was almost exclusively under a length rule, producing a wide and shoal boat; and the length on deck was taken, wholly or in part, instead of the length on water-line, thus producing a craft with square ends and no overhang. The progress of British yachting during this period was far more varied and interesting. The adoption, through the America and Musquito, of finer bows and better general form was followed by a further contraction of beam, to save tonnage, to offset which an outside shoe of cast iron was added below the keel, in addition to the heavy weight of shot carried in the weather bilge. To such a dangerous extreme was this latter practice carried that in 1856 it was rigidly prohibited by a rule which has been in existence ever since in Great Britain, forbidding the shifting of any weights during a race. This restriction stopped for a time the process of decreasing the beam a little in each successive yacht to gain more size on the same nominal tonnage, the narrow yachts having insufficient stability when deprived of the weight to windward. The inventive powers of owners and builders soon disposed of this difficulty by using a heavier iron shoe, and filling every inch of space between the floors and keelson with lead accurately moulded to fit. About 1870 a great change was made in the placing of a very large proportion of the ballast in a lead keel outside the oak keel.

The extent of this change is shown by a comparison of the racing-yawl Florinda, built in 1873, with the cutter Galatea, built in 1885. The Florinda, of 125 tons, yacht measurement, was 85 ft. 9 in. on the water-line, 19 ft. 4 in. beam, and 11 ft. 9 in. in draught, with 54 tons of ballast, of which but 8 tons were on the keel; the Galatea, of 90 tons measurement, was 86 feet on the water-line, 15 feet beam, and 13 ft. 3 in. draught, her ballast, 78 tons, being all carried at the lowest possible point, in her trough keel, the hull being of iron.

For a long time yacht-builders were, as a rule, men of large practical experience but little technical education, planning their yachts by ways of their own, and knowing little of the accepted methods of the trained naval architect. It was about 1870 that they began to feel the first competition from young men of thorough technical education, who, giving no thought to the business of yacht-building, devoted themselves seriously to the work of producing designs on paper from which yachts could be built with some reasonable certainty of good performance. The work of such men as Watson, Richardson, Beavor-Webb, Clayton, Paton, all of whom

SHAMROCK. COLUMBIA.

International yacht-race off Sandy Hook, N. J., October, 1899.



Typical British and American racing-yachts, 1851–1895.

are distinctively designers, received recognition in Great Britain prior to 1880; and from that time onward all yachts have been built from plans carefully worked out on paper after a recognized method, whether by a professional designer or by one who combines the two occupations of designing and building.

The first yacht built from a design in the U. S. was the iron cutter Vindex, designed by A. Cary Smith in 1871. In spite, however, of the success of the Vindex, and of other yachts designed by Smith, it was not until 1884 that the old method of building from a wooden model carved out by the builder was finally abandoned. Though the Vindex was a very successful yacht, her building had no effect on the national type. The visit of the America in 1851 was returned in 1870 and 1871 by the English schooners Cambria and Livonia, each of which sailed at New York and was defeated in the attempt to regain the America's cup; and then all interest on the part of yachtsmen of the U. S. in the progress of the sport across the sea ceased entirely, and the development of the national type proceeded independently on the lines already indicated.

In the fall of 1880 James Coats, of Paisley, a wealthy Clyde yachtsman, sent to New York on the deck of a steamer a very successful 10-ton cutter, the Madge, the work of the young Scotch designer, George L. Watson, in every respect a perfect craft of the type. A number of matches were made with representative sloops as nearly as possible of the same size, and seven races were sailed off New York and Newport, in which Madge scored six victories, being once defeated by the famous Boston sloop Shadow, the deepest yacht of her type, and the most successful. The other sloops, Schemer, Wave, and Mistral, were badly defeated by the little Scotch boat.

The victory of the Madge proved the merits of her type in many points, if not her all-around superiority; in particular were her rigging, sails, and the handling of her Scotch crew superior to those of her opponents. In 1881 was built the cutter Oriva, of 50 feet water-line, and next year the Bedouin, of 70 feet, and the Wenonah, of 60 feet, all built by Piepgrass from designs by Mr. John Harvey, the English designer. These three yachts were wider by 1 to 2 feet than the British cutters of the day. Several cutters were imported from England, and, with those built in the U. S., gave battle to the sloops, through 1882, 1883, 1884, the result being that while certain faults, notably the lack of beam, were plainly apparent in the cutters, the superiority of the cutter rig, of the lead keel, and of other important features was conceded very practically by the process of rebuilding and rigging the sloops; while many new yachts of wide beam but much greater depth, and with a centerboard working through a lead keel, were built under the general name of "compromise sloops."

Modern International Races.—This process of reconstruction and modification found its most successful embodiment in 1885, in which year a challenge was received by the New York Yacht Club for the America's cup, on behalf of the British cutter Genesta, of 80 tons, 81 feet water-line, a fast and fitting representative of the extreme cutter type. Of the two yachts built to defend the cup, the successful one, both in the preliminary trial races, and the final races with the Genesta, was the Puritan, a centerboard yacht with a deep outside keel of lead and a cutter rig modified in mechanical details, the cotton mainsail being laced to the boom, and the bowsprit being permanently fitted. The Puritan's designer, Edward Burgess, of Boston, was practically an amateur, though an old and experienced yachtsman, she being the first yacht of any size which he produced after adopting the profession of yacht-designer. In 1886 there came a new challenge from the Galatea, a sister ship to the Genesta, and she was in turn defeated by an enlarged Puritan, the Mayflower, also designed by Burgess. In the periodic discussions over the tonnage rule which at intervals disturbed British yachtsmen, the suggestion was made about 1880 by Dixon Kemp, a designer and yachting writer, that length combined with the sail area should be employed in place of the rule which was producing narrower and deeper yachts each year. In 1882 this rule was adopted in a primitive form by the Seawanhaka Corinthian Yacht Club of New York, and in 1883 it was remodeled into what has since been known as the "Seawanhaka rule," the length on the water-line being added to the square root of the sail area, and the sum divided by 2. At the same time the New York Yacht Club adopted the rule in a slightly different form. The Seawanhaka rule has since been adopted by nearly every North American yacht club. The movement for the adoption of the length and sail-area rule had been gaining strength in Great Britain for some years previous to the defeat of the Genesta and Galatea, and in the winter following the victory of the Mayflower over the Galatea the change was made, the old tonnage rule being finally abandoned, and what has been since called the "rating rule" adopted. By this rule the length and sail area are multiplied together, and the product divided by 6000, the quotient being the "rating" of the yacht $\left(\frac{L \times SA}{6000} = R\right)$. This particular form of the rule was adopted merely to conform in a measure to the established custom, British yachtsmen having for two generations been accustomed to a cubic form of measurement rather than to a lineal form, as used in the U. S.

This change of rule gave new liberty to the designer, leaving beam entirely untaxed, and he was not slow to appreciate the situation. Between 1886 and 1890 there grew up a fine fleet of yachts, of excellent design, light and elaborate construction, and great speed. The first large yacht built under the new rule, the Thistle, designed by Mr. Watson to challenge for the America's cup in 1887, though very successful against the older cutters at home, was badly defeated by a new champion, the Volunteer, a still deeper centerboard yacht built of steel from Burgess's design.

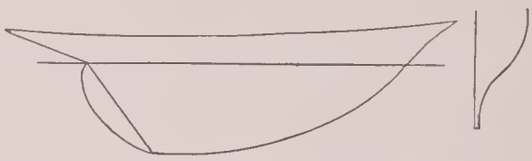


Fig. 13.—Keel yacht (1890) with midship half-section.

The influence of the three years' racing for the America's cup was strongly felt on both sides; in the U. S. the keel cutter came to the front very rapidly in the smaller classes, and some very exciting races were sailed in 1889–90 in the 30 feet and 40 feet classes. These yachts were of considerable beam and even more draught than the old cutters, with very large sail plans, rigged as cutters save that the mainsail was laced to the boom, the sails being all of cotton instead of hemp, and the bowsprit was a fixture. In the larger classes the deep centerboard yacht was still successful, for the reason that yachtsmen were reluctant to take the extreme draught essential to a perfect keel yacht; but in the classes up to 53 feet water-line the keel yachts were almost uniformly successful against both the old sloops which had been remodeled and the more modern "compromise" sloops.

The year 1891 was marked by the production in the U. S. of two noted yachts, both designed by N. G. Herreshoff. The first of these, the Gloriana, was a keel cutter of 45 feet water-line, 13 feet beam, and 10 feet draught, with a sail plan of 4,000 sq. feet by the Seawanhaka measurement, a very large rig. While of the general form of the yachts of the day, she carried to an extreme degree two details of modern designing. The water-line was excessively round and full at both ends, with no suspicion of hollow at the bows, giving a large area of water-line plane and corresponding stability, the hull below the water being boldly cut away into a hollow S-section. In consonance with this form below water, the topsides were carried out by the prolongation of the under water-lines until they reached their natural limits by converging at bow and stern, giving very long and full overhangs at each end.

The "wave-line" theory of Scott Russell, in 1840, called for excessively fine water-lines in the bow, involving a great amount of deadwood and wetted surface that was detrimental to speed. The true application of Scott Russell's theory was first developed by John Hyslop about 1875, his proposition being that the true wave form demanded not that the water-lines of a vessel should be of any one form, but that the growth of the bulk, from the bow to the midship section, and its decrease then to the stern, should follow a certain distinct rate of progression, the "curve of areas" of the transverse sections, representing this growth and decrease of bulk, being a curve of versed sines in the fore-body and a trochoid in the after-body. So far from conflicting with the elaborate investigations and deductions of Scott Russell, the discovery of Hyslop served to complete and perfect them and to make them for the first time of practical application in designing. It is remarkable that

this "wave-form" theory was discovered simultaneously by Hyslop, working in New York, and a Norwegian naval architect, Colin Archer, living in Laurvig, Norway; they were unknown to each other and worked on original and distinct methods to the same end.

By this new theory, accepted by all yacht-designers, the form of the water-lines could be materially modified, provided the volume of the immersed body at any point was properly proportioned. In the early yachts the full round water-lines were carried down to the full depth of the keel, making a bow that was excessively bulky. In the Gloriana only the load water-line was full, the hull being cut away excessively below, so as to preserve the fineness of bulk demanded by theory. Apart from the special features of the full water-line and long ends, the yacht was a masterpiece of light construction, on the composite system, with a beautiful outfit of sails, and a rig that included many new me-

FIG. 14.—Fin-keel yacht (1891-95) with lead bulb and balance rudder, with midship half-section.

chanical devices invented by the clever designer, who also sailed her in many of her races. The fame of her success was emphasized by her peculiar features, and she will always stand in yachting history as a remarkable craft.

In the fall of the same year Herreshoff designed and built a small experimental craft, in which the tendencies already noted—toward a very hollow section and reduced lateral plane—were carried to an extreme degree, the hull being that of a canoe about 39 feet over all, 25 feet water-line, 7 feet beam, and but 2 feet immersed depth. To this shoal hull was attached a fin of steel plate about ⅜ inch thick, the lower edge of the fin carrying a cigar-shaped bulb of lead. The Dilemma, as she was called, was a great success, and in 1892 she was followed by others of her type from the Herreshoff shops—the firm being both designers and builders—several of them going to British waters and racing with hardly a defeat.

The interest in racing being still maintained, the models of each successive year showed a closer approach to the fin-keel type in the larger classes, and when a challenger came in 1893 for the America's cup, two of the four large yachts built for the defense, of 87 feet water-line, were fin keels, one, the Pilgrim, an extreme fin, drawing 22 feet, the other, the Jubilee, having a shoaler fin but 13 feet extreme draught, but with a centerboard working through the fin. The successful yacht, both in the trial and cup races, was the Vigilant, designed by Herreshoff, of 87 feet water-line, 126 feet over all, 26 feet beam, and 13 feet draught, with a very hollow section and a deep keel that was virtually a fin, to which was added a centerboard weighing 4 tons. The frames of the yacht were of steel, and the plating of an alloy—Tobin bronze. Opposed to her was the Valkyrie II., designed by Watson, a keel cutter of composite build, of the same length, but under 23 feet beam, and drawing 17 feet of water. The Vigilant was victorious in three races.

In 1894 the Valkyrie II. was refitted with a larger rig and more ballast, and the Vigilant, purchased by George J. Gould, was sent across to take part in the British racing. After only two trials the Valkyrie II. was sunk by collision with the Satanita in the Mudhook regatta on the Clyde on July 4. The Britannia, Vigilant, and Satanita sailed out the season with the result that the first named scored a wonderful success, winning 12 out of 17 races from the Vigilant.

Again, in 1895, came another challenge from the owner of Valkyrie II., the Earl of Dunraven, and a still larger yacht (Valkyrie III.) was designed for him by Watson, her length on water-line being 90 feet, beam 26 feet, and draught 20 feet. This time but one yacht was built to meet her, the Defender, designed and built by N. G. Herreshoff, of 90 feet water-line, 23 feet beam, and 19 feet draught. In the first race Defender won, in the second Valkyrie was disqualified as the result of a foul, and Lord Dunraven declined to sail the third.

In Aug., 1899, came a challenge from the Royal Ulster Yacht Club of Ireland, in behalf of Sir Thomas Lipton, and the races were arranged for October, 1899. The Shamrock, for Sir Thomas Lipton, and the Columbia, for a syndicate of American yachtsmen, were built by Mr. Fife, at the Clyde shipyards, and the Herreshoff Brothers, at Bristol, R. I., respectively. The races, resulting in a victory for the American boat, were sailed Oct. 3-21 off Sandy Hook. Sir Thomas Lipton again challenged in 1900, the races to be sailed in 1901.

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Yak [from Tibetan *gyag* or *gyak*]: the *Bos grunniens*, a bovine animal of Tibet. It is about the size of a small ox, very hairy, and has a long sweeping tail. The legs and neck are short, horns small and half hidden in the long hair; the shoulders bear a great mass of hair which suggests a hump. The wild yak is much less shaggy than the domesticated variety, and of a nearly uniform deep brown or blackish color. The domesticated animals are generally black or white, or black and white, the latter most commonly. Its hair is not coarse, though long and thick; and though the creature, when wild and disturbed or wounded, may prove terribly fierce, yet it can be easily tamed and domesticated. Its hair protects it from the cold of the great mountain-heights which it loves to frequent. It is a sure-footed animal, climbing over rocks with the agility of a chamois. It is found only in the plateau region between the Altai and Himalaya Mountains, ranging upward to an altitude of 20,000 feet. The Tibetans frequently keep large domesticated flocks of yaks, and the milk is much prized. It is very rich and yellow, and has a strong but pleasant odor. The yak does not low like an ox, but has a peculiar sharp, quick, deep voice, very similar to the grunt of a boar. Its flesh is superior to venison. The Tibetans frequently use its skin for clothing. F. A. L.

Yako'nan Indians: a family comprising four tribes of North American Indians, whose name is a corruption of that of the leading tribe, the Yaquina, or Yakwina. This family was based by Hale upon a single tribe, then numbering 600 or 700, who lived on the coast, N. of the Nsictshawus (probably the Ntsi-ya'mīs, a village of the Ku-ite, or Lower Umpqua), from whom they differed merely in language. Hale calls the tribe Iakon, or Yakones, or Southern Killamuks. The Siuslaw language has usually been assumed to be distinct from all others, but there is unquestioned evidence of relationship between the Yaquina, Alsea, Siuslaw, and Ku-ite, or Lower Umpqua, the four tribes that constitute the Yakonan family. The Yaquina tribe must have been of importance in early days, as it occupied fifty-six villages on both sides of Yaquina river, from the site of Elk City, 30 miles down to the Pacific Ocean. The Alsea formerly occupied twenty villages along both sides of Alsea river and on the adjacent coast. Most of the Alsea are with the Yakwina on the Siletz reservation, Oregon; but a few of them are on the Grande Ronde reservation, in the same State. The Siuslaw used to inhabit thirty-four villages along Siuslaw river. The Ku-ite, or Lower Umpqua, had twenty-one villages along both sides of Umpqua river, from its mouth up the stream for about 30 miles. Above the Ku-ite villages on the Umpqua river were the Upper Umpqua villages, occupied by Athapascan Indians. See INDIANS OF NORTH AMERICA. J. OWEN DORSEY.

Yakutsk', or **Jakutsk**: Russian province (*Oblast*) of East Siberia, embracing almost the entire basin of the immense Lena river; bounded W. by the Yeniseisk, N. by the Arctic Ocean, S. by Irkutsk, the Transbaikal and the Amur provinces, and E. by the narrow strip of the maritime district of Ochotsk, which separates it from the Pacific. The immense province with an area of 1,533,397 sq. miles (nearly one-third of Siberia) has a population of 280,000, mostly Yakuts, Yukagirs, and Tunguses who live as hunters and fishers, partly still as nomads with large herds of cattle and horses. The Russians, mostly exiles or descendants of exiles, living in about twenty villages, number some 2,000 soldiers and 4,100 artisans, merchants, and officials. The south-

eastern part of the province is a high plateau, an immense desert of forests and of marshes frozen several hundred feet deep; but the wealth of the forests in fur-bearing animals and of the rivers in fish is unbounded. In the southwest gold-mining is growing. H. S.

Yakutsk: capital of the province of Yakutsk, Siberia; on the Lena, in lat. 62° 2′ N., and 129° 44′ E. lon.; founded in 1632 as a Cossack station (see map of Asia, ref. 2–H). It is the seat of a governor and the provincial authorities. The place has straight, unpaved streets, wooden houses, a cloister, a cathedral, 3 churches, a pro-gymnasium for boys and one for girls, and 2 primary schools. It is the center for the North Siberian trade in furs, mammoth-bones, reindeer-hides, tallow, and fish, which are exported for groceries and manufactured goods. The great fair, frequented by the natives all over the province, takes place from June 22 to Aug. 13 (new style), with an estimate of returns amounting to $2,250,000. Pop. 5,698. H. S.

Yale, Elihu, F. R. S.: philanthropist; b. in or near Boston, Mass., Apr. 5, 1648; son of Thomas Yale, one of the original settlers of New Haven, Conn., 1638, who soon after removed to Massachusetts and in 1651 returned to England, followed in 1652 by the rest of his family. Elihu went to India to engage in trade about 1670; was governor or president of the East India Company's settlement at Madras 1687–92; amassed a fortune; returned to England 1699. He never went back to New England, but he became interested in the "Collegiate School" at Saybrook, Conn.; favored it instead of bestowing a charity upon a college at Oxford as he had intended to do, and at different times—1715, 1718, 1721—sent over books and goods valued at more than £600 sterling. The largest remittance—1718—was in response to a hint to the effect that by making further donations he might have the college building, then in process of erection at New Haven, named after him. In 1745 the name Yale College was extended to the whole institution. Yale died in London, July 8, 1721, and was buried at Wrexham, North Wales, the ancient seat of his family.

Yale University (formerly **Yale College**): an institution of learning chartered as "the collegiate school of Connecticut" by the General Assembly of the colony of Connecticut Oct., 1701. From the first settlement of New Haven (1638) it had been intended to set up a college there, and it was in execution of this design that the minister of New Haven, James Pierpont, in concert with nine other Congregational ministers, most of whom were of the Connecticut seaboard, effected in Sept., 1701, the foundation of the collegiate school. The ten ministers made trustees by the charter were empowered to set up and carry on the school where they should see fit, and to perpetuate their own body. By an additional act (1723) the rector or head master of the school was made a trustee *ex officio*. The school was formally established at Saybrook in Nov., 1701, though the classes until 1707 were taught at Killingworth (now Clinton), an adjoining town, where Abraham Pierson, the first rector, was pastor. After long dissatisfaction and amid much opposition the school was permanently settled in New Haven in 1716, and in 1718 its name was changed to Yale College in recognition of a large gift from Elihu Yale (*q. v.*), of London. In 1745 the present charter was granted by the General Assembly, confirming the trustees in all their powers under the title of "the president and fellows of Yale College in New Haven." Down to the period of the Revolution the college received from the colonial Government stated or occasional grants of funds, without which it could hardly have survived. In 1792 the Governor, Lieutenant-Governor, and six senior Senators of the State were made, *ex officiis*, members of the corporation, the State making at the same time a grant valued at $30,000 to the college funds. The constitution of Connecticut, adopted in 1818, expressly confirms the charter of Yale College. In 1871 the Assembly, with the assent of the corporation, substituted for the six Senators six graduates of the college, who were chosen, as their successors (one vacancy occurring annually) are also chosen, by the votes of a plurality of graduates of the first degree of five years' standing. In Jan., 1887, the use of the title Yale University was authorized by the General Assembly. For the first 100 years instruction was given chiefly by the rector or president, assisted by two or three tutors chosen from among the recent graduates and serving for brief periods. A professor of divinity (or college pastor) was appointed in 1755, and in 1770 a professor of mathematics, though the chair was not permanently occupied till 1794. It was not until the nineteenth century that the system of permanent professors, assisted still by temporary instructors, was fully established. There are more than 250 instructors, nearly one-half of whom are permanent officers. The presidents from the foundation of the institution have been Abraham Pierson (1701–07), Samuel Andrew (1707–19), Timothy Cutler (1719–22), Elisha Williams (1726–39), Thomas Clap (1740–66), Naphtali Daggett (1766–77), Ezra Stiles (1777–95), Timothy Dwight (1795–1817), Jeremiah Day (1817–46), Theodore D. Woolsey (1846–71), Noah Porter (1871–86), Timothy Dwight (1886–99), Arthur Twining Hadley (1899). The president is the presiding officer of the board of trustees and of every board of instruction. He has no required duties of teaching. There are four departments of instruction grouped under the name of Yale University, viz., the departments of philosophy and the arts, of theology, of law, and of medicine, the first of these including the academical department (the original Yale College, around which all the others have been developed), the Sheffield Scientific School, the School of the Fine Arts, the musical department, and the courses of graduate (or advanced non-professional) instruction. Degrees in arts were first given in 1702, in medicine in 1814, in law in 1843, in philosophy in 1852, in theology in 1867, in fine arts in 1891, and in music in 1894. The whole number of graduates is (1900) 19,645, of whom about 8,500 are deceased. The annual commencement is held on the last Wednesday in June, and the college year begins thirteen weeks later. The number of students enrolled on the annual catalogue for 1899–1900 was about 2,500, of whom about 400 were in the Sheffield Scientific School and 250 in the graduate department.

The course of study in the academical department, now known as Yale College, extends through four years, and leads to the degree of bachelor of arts. The requirements for admission are mainly in Greek, Latin, and mathematics, and the first two years of the course are given largely to further drill in these branches; while the studies of the last two years take a wider range, the most of the time in these two years being given to advanced courses in subjects in which the student has already made some progress, and which he chooses from among a larger number offered to his option. The annual charge for tuition and incidental expenses is $155. Beneficiary funds help to meet this charge for those who need such relief to the extent of over $20,000 yearly. Nearly $10,000 is also disbursed yearly to graduate and undergraduate students in premiums for the encouragement of scholarship. The permanent funds of the department (exclusive of real estate, buildings, and apparatus devoted to academical uses) are about $1,500,000. The oldest college buildings occupy a square (about 850 feet by 400) in the center of the city, and on the west side of the public green, but the growth of the college has caused the erection of buildings for this department on adjoining squares also. There are nine dormitories, built from 1752 to 1894, and accommodating about 700 persons. There are also on the central square a chapel, a library, an art school, a building for the use of the Young Men's Christian Association, and six other buildings used as halls, recitation-rooms, and offices. The buildings form a quadrangle inclosing an open space. A very fine gymnasium, for the use of all the students of the university, was erected in 1893 immediately to the N. W. of the college square. There is a well laid-out athletic field about a mile and a half W. of the university buildings.

The Sheffield Scientific School, begun in 1847 as a school of applied chemistry, was gradually expanded until in 1860 it received its first considerable endowment from Joseph E. Sheffield, of New Haven, who afterward largely added to his original gift. The school provides for advanced and special students in the mathematical, physical, and natural sciences, and also for undergraduates who wish a training leading chiefly in this direction. It has five buildings, situated two squares N. of the college square. The State Legislature appropriated to the school in 1863 the national grant of 1862 for the benefit of agriculture and the mechanic arts, the income from which amounts to $6,530 annually, besides the additional appropriations by Congress. In 1893 the Legislature passed an act taking this appropriation away from the Sheffield School, but this led to litigation. The course of instruction leading to the degree of bachelor of philosophy occupies three years. The degrees of civil and mechanical engineer are given to bachelors of philosophy after a higher course of two years, and the degree of doctor of philosophy after a three years' course. The charge for tuition is $150 a year. The degree of Ph. D. is also given

to bachelors of arts who have pursued advanced studies at the university for two years, and the degree of M. A. is given for one year's similar study at the university or elsewhere under the direction of the faculty. Women are admitted to the courses for the degrees of Ph. D. and to the School of Fine Arts, but not to other departments.

The School of the Fine Arts was founded in 1864 by Augustus R. Street, of New Haven, who erected a building on the college square for its use and otherwise endowed it. Instruction is provided in drawing, painting, sculpture, architecture, and copper-plate etching. The degree of bachelor of fine arts is conferred on students who have fulfilled the requirements of an advanced course. The annual fees are $100.

The theological department was founded in 1822 in connection with the Congregational denomination, and provides a three years' course of study. There is also a graduate course of one year. There is no charge for instruction or for room-rent in the buildings belonging to the school. It is open on equal terms to students of every Christian denomination. It possesses two dormitories, a library building, and a chapel, situated immediately N. of the college square.

The law department, begun as a private school soon after 1800, was not recognized as part of the college until 1824. It now offers a three years' course for the degree of LL. B., and also advanced courses with appropriate degrees at the end of one and two years. Special courses of one and two years are also provided for persons desiring acquaintance with law as a preparation for business life, or with political and legal systems and the rules by which they are governed. The annual tuition fees are $100. For many years the school found quarters in the county court-house. In 1895 it occupied a building erected for it on the north side of the public green.

The medical department was organized in 1813, and in 1814 received a grant of $30,000 from the State. It was originally conducted under a charter obtained in 1810, which placed the school under the joint control of Yale College and the Connecticut Medical Society. In 1884 the medical society withdrew from the control. The requirements for a degree include attendance on three yearly courses of lectures. The building of the school is situated about a block and a half to the S. W. of the college square. Students in the medical department have the advantage of clinical instruction, etc., at the New Haven Hospital. The annual lecture-fee is $140.

The University Library, which is open to students in all departments, contains about 175,000 volumes and many thousands of unbound pamphlets. In the same building is a separate library of about 30,000 volumes, supported by the undergraduates and devoted to general literature. There are also special libraries belonging to the theological, law, medical, and scientific schools. The total number of volumes in the several libraries of the university is about 258,000.

The Peabody Museum of Natural History, devoted chiefly to zoölogy, geology, and mineralogy, was established by a gift of $150,000 from George Peabody, of London, in 1866. One wing of the proposed museum has been erected, directly W. of the college square.

The university possesses an excellent observatory situated about a mile and a half from the college grounds. It was built from funds given by Hon. Oliver F. Winchester, and largely endowed by Prof. Elias Loomis. F. B. DEXTER.
Revised by BERNARD C. STEINER.

Yam [from Span. *iñame*, *ñame* : Portug. *inhame*, from Afr. *nyame*]: the tuberous root of species of *Dioscorea*, climbing vines of the family *Dioscoreaceæ*. Yams are extensively grown in all warm countries as food. Some of the wild sorts are nauseous and even poisonous. Yams are successfully grown in the southern parts of the U. S., and the Chinese yam (*D. batatas*, or properly *D. divaricata*) thrives in the northern parts, but its great roots, though often of excellent quality, have a tendency to bury themselves so deeply in the earth that they can only be reached at considerable trouble. The air-potato is a Dioscorea (*D. bulbifera*) which bears large edible tubers in the axils of the leaves. The term yam is also applied to various forms of the sweet potato. See FOOD. Revised by L. H. BAILEY.

Yama: a Hindu deity, represented in the earliest legends as the first man who died, and the guide to the land of spirits of the spirits of other mortals. At a later date he is represented as presiding over the spirits of the just who dwelt in the upper sky or the heaven called Yama. (See DEVALOKA.) In the Purānas he appears as the judge and punisher of the dead, awarding heaven or hell according to the balance of merit or demerit shown on the books kept by Chitragupta, his recorder. Death is his messenger. Two hideous dogs, each with four eyes, guard the approaches to his abode. In painting and sculpture he is generally represented as seated on a buffalo; he is four-armed and of austere aspect. In one hand he holds a mace and in another a noose. His eyes are inflamed and bloodshot and his teeth are like those of a tiger. His twin-sister is Yamī. In Buddhism Yama becomes the monarch of hell. (See NARAKA.) Originally, it is said, he was a king of Vais'āli, who having expressed a wish, while engaged in a bloody war, to be the ruler of hell, had his wish granted. He was reborn as Yama, along with his eighteen officers and his whole army of 80,000 men, who now serve under him as assistant judges, jailers, and executioners. By way of punishment for past offenses, however, a demon three times a day pours boiling copper into their mouths and squeezes it down their throats, causing them intense suffering. When Yama's sins have been expiated he will be reborn as Buddha under the name of the Universal King. His sister Yamī controls all the female culprits. See Monier-Williams's *Brahmanism and Hinduism* (Oxford and New York, 1891) and Eitel's *Handbook of Chinese Buddhism* (Hongkong, 1870). R. L.

Yamachi'che: post-village; St. Maurice County, Quebec, Canada; on Yamachiche river, and Canadian Pacific Railway (see map of Quebec, ref. 4–B); near the St. Lawrence; 15 miles W. S. W. of Three Rivers. It has an academy, a convent, trade in grain and lumber, and some manufactures. Pop. (1891) about 2,700. J. M. H.

Yamagata, yăă'măă'gaa'tăă, ARITOMO, Marquis: Japanese soldier and statesman; b. 1838, in the province of Choshû; entered the army and took a leading part in the suppression of the shogunate; was appointed second vice-minister of war in the new government, and in 1869 was sent on a military mission to Russia and France. In 1876 he was in command of an army ready to embark for Korea to avenge an insult to the Japanese flag, but the trouble was patched up. As a strict disciplinarian he took a leading part in abolishing the custom of wearing swords, since 1876 reserved for the services. (See SAMURAI.) He added to his reputation by the ability he showed in the Satsuma rebellion campaign of 1876–77. In 1878 he was appointed commander of the imperial guard and head of the general military staff. Since then he has served as Minister of the Interior, as Prime Minister (1889–91), and as Minister of Justice (1891–93). In 1884 he was created a count in the new order of nobility. When the war with China broke out in 1894, he was given command of the First Army-corps, and by his brilliant and effective strategy expelled the Chinese from the Korean peninsula in a few weeks, receiving a marquisate in recognition of his services, 1895. His policy all along has been in favor of a thorough assimilation of European methods. He is noted for his indomitable resolution, ardent patriotism, and strict integrity; and as a general is considered the ablest strategist in the empire. J. M. DIXON.

Yamaguchi, yăă'măă'goo'chĕĕ': the most important town in the province of Suwo, Southwestern Japan; situated in a plain surrounded by mountains, about 15 miles from the sea. It was formerly the castle-town and residence of the powerful Mori family, lords of Choshû, and is now the seat of the local government. Ito, Inouye, Yamagata, and others of the leading men of the new era were born in this city or the vicinity. It possesses a higher middle school established and endowed by the former lord. In the sixteenth century the Christian Church here, founded by Xavier in 1550, was strongly organized, and was finally crushed after a hard struggle. Pop. (1894) 14,418. Until 1860 Hagi, 20 miles to the N., was the capital of the province. J. M. DIXON.

Yamaji, yăă'maa'jĕĕ', MOTOHARU, viscount: Japanese soldier, and perhaps the most popular hero of the China-Korean campaign of 1894–95; b. in the province of Tosa, Shikoku, about 1840. When a boy he lost an eye through an accident, and now goes by the name of the One-eyed Dragon. He served with distinction in the Satsuma campaign of 1877, and in due time became lieutenant-general and a peer. When the Japanese forces invested Port Arthur, Nov., 1894, the conduct of the attack was intrusted to him by Gen. Oyama, his superior, and he carried it out with wonderful pluck and vigor. He was advanced from baron to viscount in the distribution of honors in 1895. J. M. DIXON.

Yamas'ka River: a river of the province of Quebec, Dominion of Canada; rises in Brome Lake, Brome County, and flows westerly as far as West Farnham, Missisquoi County, from which point its course is northerly until it empties into Lake St. Peter, an expansion of the St. Lawrence. The length of the Yamaska river is about 100 miles, and it flows through a fertile country. The towns on its many branches are Granly, Waterloo, Cowansville, Farnham, and St. Hyacinthe. Revised by J. M. HARPER.

Yamato, yaä'maa'tō': the "home" province of the Japanese empire, having NARA (*q. v.*) as its chief town. The name was once applied to the whole empire, as it still is in poetry. The "Yamato" language is Japanese free of all Chinese admixture, and is used in poetry and the compositions of literary women. The phrase *Yamato-Damashii* is employed to signify the chivalrous and cultured spirit of old Japan, and has often been used by the conservative party, jealous of the intrusion of a mean, commercial spirit. The Yamato school of painting corresponds to the Tosa (see TOSA-RIU), which is a development of it, and has been of great service in preserving a record of the costumes, manners, and ceremonies of old Japan. J. M. D.

Yam'bu, Yanbu, or **Yembo**: town in El Hedjaz, Arabia; nearly 100 miles W. S. W. from Medina, of which it is the port (see map of Persia and Arabia, ref. 6–C). It has a good though exposed harbor, and is important as one of the principal stations of pilgrims to the holy places of Arabia. Pop. about 5,000. E. A. G.

Yanan (yaa'năn) **Indians** [in their language *Yana* means people]: a family of North American Indians, represented by a single tribe, the Yana, chiefly known to the settlers by the name Noje or Nozi. They formerly occupied the territory from Round Mountain, near Pitt river, Shasta County, to Deer creek, Tehama County, Cal. The western boundary from Redding southward was on an average 10 miles to the E. of the Sacramento river, both banks of that river being held at that time by the Wintun, with whom the Yana were in frequent warfare. The Yana have a tradition that they came to California from the Far East. They are said to differ markedly in physical traits from all California tribes, and their language seems unrelated to any other. They are reduced to two little groups, one at Redding, and the other in their original country, at Round Mountain, Cal. In 1884 they numbered thirty-five persons. J. O. D.

Yana (yaa'naä) **River**: a river of Siberia, 1,000 miles long, with its tributaries Adiga, Dulgalak, Shemanova, and Butaktai, and one of the most considerable Arctic rivers in the Yakutsk province. It rises on the north side of the Tukalan Mountains between 61° and 62° N. lat., where also the Indighirka (950 miles) and Kolyma (1,000 miles) have their origin, flows N. and N. E, and empties into the Arctic Ocean by several mouths in lat. 72° N. H. S.

Yang and **Yin**: in Chinese cosmogony, the positive and negative essences evolved by the T'ai-k'i or Ultimate principle of Being, by the action and interaction of which all things are produced. Yang is the male or masculine essence, Yin is the female or feminine; Yang is light, Yin is darkness; Yang is heaven, Yin is earth.

Yang-tse-Kiang (literally, the Yang-tse river): the name by which the principal river of China is known to foreigners. See CHINA.

Yanina: another spelling of JANINA (*q. v.*).

Yankee Doodle: a national air of the U. S.; originally known under the title of *The Yankee's Return from Camp*. It is reported to have been a popular tune in England during the Commonwealth, at which time its doggerel words originated. Others say that it was the tune originally set to the old English song, *Lydia Locket lost her pocket*, and that the words now used were composed in 1755 by Dr. Schuckburgh, a British surgeon who served under Gen. Amherst during the French and Indian war in North America, and who took this means of ridiculing the colonial militia. Still other accounts of its origin are given. It was introduced by Samuel Arnold into his opera *Two to One* (London, 1784). See Helen K. Johnson, *Our Familiar Songs* (New York, 1881).

Yankton: city; capital of Yankton co., S. D.; on the Missouri river, and the Chi. and N. W., the Chi., Mil. and St. P., and the Great North. railways; 61 miles N. W. of Sioux City, Ia., and 140 miles N. W. of Omaha, Neb. (for location, see map of South Dakota, ref. 8–G). It is in an agricultural region, and is connected by steamboat and stage lines with the principal ports on the Missouri river and the military posts and Indian agencies on the upper Missouri. It has 8 churches, Yankton College (Congregational), the Academy of the Sacred Heart, the State Insane Asylum (cost $300,000), 2 national banks with combined capital of $100,000, an incorporated bank with capital of $25,000, a State bank with capital of $8,250, a daily, a monthly, and 6 weekly periodicals, and 12 artesian wells. The city has a pork-packing establishment, woolen-mill, several breweries, and Portland-cement works with capacity of 300 barrels per day, and a large trade with the interior in general supplies. Pop. (1883) 3,431; (1890) 3,670; (1900) 4,125.

PUBLISHERS OF "PRESS AND DAKOTAN."

Yankton Indians: See SIOUAN INDIANS.

Yantic River: a stream which unites at Norwich, Conn., with the Shetucket river, about 3 miles below the junction of that stream with the Quinebaug river. These three rivers form the Thames. The Yantic affords large and well-utilized water-power.

Yapock: See CHEIRONECTES.

Yapurá: See JAPURÁ.

Yaquina Head: See CAPE FOULWEATHER.

Yard [M. Eng. *yerd* < O. Eng. *gierd*, *gyrd*, rod, stick, measure, yard: O. H. Germ. *gartia* (> Mod. Germ. *gerte*, switch, rod: Goth. *gazds*, goad. Cf. Lat. *hasta*, spear]: the fundamental British statutory unit of length. Its prototype, for an account of which see WEIGHTS AND MEASURES, is in actual use at the Standard Office, London.

Yarkand': Chinese city of Eastern Turkestan; lat. 38° 22′ N., lon. 77° 15′ E., about 130 miles S. E. of Kashgar; on a canal derived from the river Yarkand (see map of China, ref. 3–A). It is surrounded by an earthen wall and defended by bastions at the angles. The citadel is outside the walls. Caravans from India arrive at Yarkand, carrying with them the manufactures of Manchester, and through Russian Turkestan lines of commerce connect it with the Caspian Sea and Moscow. Its manufactures of silks, cottons, linen, and woolens are important. The city is well built; the houses are mostly of stone; the streets are very narrow, frequently intersected by canals; the bazaars, caravanserais, and mosques are numerous. The population was estimated at 35,000 to 40,000 by Roborovsky in 1891.

Yarmouth, yaar'mŭth: town; in the counties of Norfolk and Suffolk, England; 122 miles N. N. E. of London (see map of England, ref. 9–M). It stands on a tongue of land between the North Sea and the Yare, along the bank of which runs a quay nearly 2 miles long. It is the principal seat of the English herring-fisheries on the east coast, and a considerable deep-sea fishing is also carried on, the produce of which is daily carried to London. Silk goods, ropes, sails, and iron are manufactured, and coasting vessels are built here. The church of St. Nicholas, founded by Herbert de Losinga early in the twelfth century and restored 1847–84, is one of the largest parish churches in England. Yarmouth returns one member to Parliament. Pop. (1891) 49,318. R. A. R.

Yarmouth: town and port of entry; Yarmouth County, Nova Scotia, Canada; on the seacoast at the entrance of the Bay of Fundy, and on the Dominion Atlantic Railway; 90 miles S. of St. John, N. B., and 205 miles S. W. of Halifax (for location, see map of Quebec, ref. 3–A). It is principally engaged in shipping, fishing, and manufacturing, and has a semi-weekly and two weekly newspapers. Pop. (1881) 3,485; (1891) 6,089.

Yarmouth: town (incorporated in 1849); Cumberland co., Me.; on Casco Bay, the Royals river, and the Grand Trunk Railway; 11 miles N. by E. of Portland (for location, see map of Maine, ref. 10–C). It contains the villages of Yarmouth, North Yarmouth, Yarmouthville, and Cousen's Island, and has four churches, high school, academy, public library, granite quarries, foundry, and cotton and paper mills. Pop. (1880) 2,021; (1890) 2,098; (1900) 2,274.

Yarmouth: town (incorporated 1639); Barnstable co., Mass.; on the N. Y., N. H. and Hart. Railroad; 75 miles S. E. of Boston (for location, see map of Massachusetts, ref. 5–K). It extends across the peninsula from Cape Cod Bay to Nantucket Sound; contains the villages of Yarmouth, Yarmouthport, South Yarmouth, West Yarmouth, and Yarmouth Farms; and has 5 churches, high school, 9 district schools, public library, a national bank with capital of

$350,000, and a weekly newspaper (both in Yarmouthport). It is principally engaged in agriculture, cranberry-culture, and navigation, and in 1894 had an assessed valuation of $1,970,777. Pop. (1880) 2,173; (1890) 1,760; (1900) 1,682.

Yar'muk [from Talmudic *Yarmokh*, whence Gr. Ἱερόμαξ, whence Lat. *Hie'romax* (mod. *Sheriat-el-Mandhur*)]: a river of Eastern Palestine. It has a strong current, is about 130 feet wide, and empties into the Jordan 5 miles S. of the Sea of Galilee. It is not mentioned in the Bible; but with its tributaries drains the ancient Bashan and Ituræa, the modern Hauran, and Djolan. It is full of fish, and is lined with oleanders. On its banks near Gadara, called by Pliny in his natural history "Gadara, before which the river Hieromix flows" (*Gadara Hieromice præfluente*), about 8 miles from Jordan, are hot sulphur springs mentioned by Eusebius and Jerome. EDWIN A. GROSVENOR.

Yaroslav, yaä-rō-slaav', or **Yaroslavl**: government of Great Russia; originally an independent principality, but annexed by Moscow in the thirteenth century. Area, 13,751 sq. miles. The surface is level, and is irrigated by the Volga and its tributaries, the Mologa and the Sheksma, in the west, where ponds and marshes abound, the chief being Lake Nero near Rostov, from which the Weksa flows. Considerable traffic is carried on by way of the Volga and the above-named tributaries which connect it by two canals with the Neva. Timber and fuel are exported, the fir and pine forests covering one-third of the area; only 27 per cent. of the total area is under cultivation, but market-gardening is extensively carried on. Yaroslav is, however, one of the chief manufacturing governments in the empire; cotton and linen, chemicals, machines and metallic wares, flour, spirits, and tobacco are abundantly produced. The villages carry on domestic trades in great variety. The entire commerce of the government amounts to 1,600,000 tons annually, one-half being carried by the two railway lines—Rybinsk-St. Petersburg and Yaroslav-Moscow-Vologda. Pop. (1897) 1,073,593. HERMANN SCHOENFELD.

Yaroslav: capital of the government of Yaroslav, Russia; at the confluence of the Kotorost and the Volga; 173 miles N. E. of Moscow (see map of Russia, ref. 6–E). It is the seat of the civil governor and an archbishop, and had a population (by census of 1897) of 70,610. The right bank of the Volga is bordered by a beautiful quay for nearly 2 miles; the suburbs are on the left bank. The city has 66 churches, the Uspenskij Cathedral (begun in 1215) and several very old churches, a theological seminary, 3 monasteries, a lyceum with a law faculty, and 3 gymnasia. There are many factories for linen and cotton goods, bell-foundries, silk-factories, and a very active traffic with Moscow and St. Petersburg. The village Velikoje Seló with 3,849 inhabitants in the district of Yaroslav is the center of linen manufacturing which is famous all over Russia. It produces goods valued at 6,000,000 rubles annually. The town of Jaroslav in Austrian Galicia, on the Cracow-Lemberg Railway, must not be confounded with Russian Yaroslav. H. S.

Yarra-Yarra: river of Australia, in the colony of Victoria; passes Melbourne and enters Hobson's Bay, the northern point of Port Philip, 3 miles below. It has a bar at its mouth, with originally but 9 feet of water at high tide; but improvements have deepened the passage until vessels drawing 16 feet can go up to the city. Above Melbourne it is not navigable. Revised by M. W. HARRINGTON.

Yarrell, WILLIAM, F. L. S.: naturalist: b. at Westminster, England, in June, 1784; formed an important collection of British fishes; was one of the originators, and long a vice-president, of the Zoölogical Society, and communicated over eighty papers to various societies with which he was connected. He published *The History of British Fishes, illustrated by 400 Woodcuts* (2 vols., 1835–36), of which the third edition was accompanied by a *Memoir of the Author* by Sir John Richardson (2 vols., 1859; *Supplement*, 1860), and *The History of British Birds with 520 Wood Engravings* (3 vols., 1839–43; 4th ed. 1881–85). D. at Yarmouth, Sept. 1, 1856. Revised by F. A. LUCAS.

Yarriba: See YORUBA.

Yarrow, or **Milfoil** [*yarrow* is M. Eng. *yarowe*, *yarwe* < O. Eng. *garwa*, *garawa*: O. H. Germ. *garawa*, *garba* > Mod. Germ. *garbe*; *milfoil* is viâ O. Fr., from Lat. *millefolium*: *mil'le*, thousand + *fo'lium*, leaf]: the *Achillea millefolium*, a European plant of the family *Compositæ*, nearly allied to camomile, wormwood, and tansy; found as a common weed in Great Britain and the U. S. It produces leaves and flowers which have a bitter, astringent taste and an aromatic odor, and yields a blue volatile oil. It was formerly much used as a vulnerary, and in Sweden is employed by brewers as a substitute for hops.

Yarrow: a river of Scotland. It rises at Yarrow Clough, near Loch Skene, flows N. E. 25 miles through Lochs Lowes and St. Mary, and falls near Selkirk into the Ettrick, a tributary of the Tweed. On its banks are the ruins of the famous Castle of Newark, and Bowhill, the family-seat of the Dukes of Buccleuch. Its current is rapid, and it affords many picturesque views, which are commemorated in three well-known poems of Wordsworth.

Yarumal': a town in the northern part of the department of Antioquia, Colombia; in a valley of the Central Cordillera; 7,470 feet above the sea-level; 320 miles N. W. of Bogotá (see map of South America, ref. 2–B). It is the center of a rich grazing district, and in the vicinity are important gold-washings in which many of the inhabitants are employed. Pop. (1892) 10,000. H. H. S.

Yassy: another spelling of JASSY (*q. v.*).

Yates, EDMUND HODGSON: journalist and novelist; b. in Edinburgh, Scotland, July 3, 1831; son of an actor; was educated at Highgate and Düsseldorf; was for many years connected with the London post-office, but resigned in 1872 in order to devote himself exclusively to literature; made a lecturing tour in the U. S. (1872–73); was for some time the London representative of the New York *Herald*, and established with Grenville Murray, in 1874, the *World* "a journal for men and women," which proved a most extraordinary success. He was the author of a great number of successful novels and works of a miscellaneous kind—*Broken to Harness* (1864); *Land at Last* (1866); *Black Sheep* (1866–67); *Wrecked in Port* (1869); *Castaway* (1872); *A Silent Witness* (1875); and two volumes of *Recollections and Experiences* (1884). For a libel on Lord Lonsdale he was imprisoned for two months in 1884. D. in London, May 20, 1894. Revised by H. A. BEERS.

Yates, RICHARD: politician; b. at Warsaw, Ky., Jan. 18, 1818; became a resident of Springfield, Ill.; graduated at Illinois College, Jacksonville, 1838; studied law and practiced at Springfield; served in the Illinois Legislature 1842–49; and in 1850 was elected to Congress on the Whig ticket; was Governor of Illinois 1860 and 1862; took an active part in raising troops for the Union army; appointed U. S. Grant mustering officer for the State and subsequently colonel of the Twenty-first Illinois Regiment; served as U. S. Senator from Illinois from 1865 to 1871. D. in St. Louis, Mo., Nov. 27, 1873.

Yates, ROBERT: jurist; b. at Schenectady, N. Y., Mar. 17, 1738; educated in New York city, where he was admitted to the bar 1760; settled at Albany; was a member of the committee of public safety 1775, of the provincial congress 1775–77, and chairman of the committee on military operations 1776; served on the committee that drafted the first constitution of the State 1776; was appointed a judge of the Supreme Court of New York the same year; chief justice 1790–98; was a member of the national convention which formed the Federal Constitution of 1787, but opposed the adoption of the Constitution in the State Convention; took notes of its proceedings, which were printed by his widow (1839); retired from the bench 1798, and was appointed a commissioner to settle disputed land titles in the "Military Tract" with the States of Massachusetts and Connecticut, and also to settle claims of New York against Vermont. D. at Albany, Sept. 9, 1801.

Yates Center: city (founded in 1875); capital of Woodson co., Kan.; on the Atch., Top. and S. Fé, and the Mo. Pac. railways; 60 miles W. of Fort Scott (for location, see map of Kansas, ref. 7–I). It is in an agricultural and stock-raising region, and has 6 churches, graded public school, a private bank, and 4 weekly papers. Pop. (1880) 350; (1890) 1,305; (1900) 1,634. EDITOR OF "NEWS."

Yaupon: a small evergreen tree, *Ilex cassine*. See HOLLY.

Yavarī: another spelling of JAVARY (*q. v.*).

Yawning [M. Eng. *yanien*, *ganien*, *gonien* < O. Eng. *gānian* (collat. form *ginian*), yawn: O. H. Germ. *ginōn* > Germ. *gähnen*: Icel. *gīna*; cf. Lat. *hia're*, Gr. χαίνειν, O. Bulg. *zijati*, yawn]: an act consisting of a deep inspiration, accompanied by an involuntary opening of the jaws to the fullest extent. It differs from sighing in these points

—that it is entirely involuntary, and that it is evidence of mental weariness or *ennui*. Its exciting cause is imperfect aëration of the blood, and it is sometimes a symptom of certain brain diseases, in which the encephalon is weakened in its functions of carrying on the operations of the organism. Yawning is performed by certain animals, as the dog, probably from similar causes.

Yaws [from Afr. *yaw*, raspberry, which the tumors sometimes resemble]: a contagious disease (*Frambœsia*) of Africa, Malaysia, the Fiji islands, the West Indies, etc. It has several varieties. It closely resembles the *Sibbens* of Scotland and the *Scherlievo* of Illyria. Some have considered it a form of leprosy, but it is more probably syphilis.

Yazoo City: city; capital of Yazoo co., Miss.; on the Yazoo river, and the Illinois Cent. Railroad; 45 miles N. W. of Jackson, the State capital, and 60 miles N. E. of Vicksburg (for location, see map of Mississippi, ref. 6–F). It is in a rich cotton and corn growing region, handles about 75,000 bales of cotton annually, and has a large cottonseed-oil plant, several lumber-manufacturing plants, water, sewerage, and electric-light systems, a national bank with capital of $50,000, a State bank with capital of $185,000, and 2 weekly newspapers. Pop. (1880) 2,542; (1890) 3,286; (1900) 4,944. EDITOR OF "SENTINEL."

Yazoo Fraud: the name popularly applied to the sale by Georgia in 1795 of the greater portion of her western territory. In 1789 the State of Georgia sold to certain companies lands estimated at 13,500,000 acres for about $200,000. Certain difficulties both as to the Indian title and the currency in which the purchasers were entitled to pay having arisen, the Legislature repealed the act. These sales, therefore, seem to have been practically inoperative; but in 1795, under a reorganization of the purchasers, the State of Georgia sold to four companies—known in history as the Yazoo Companies—for $500,000 about 35,000,000 acres of western lands. This sale naturally excited the apprehension of the Federal Government, to whose notice it was brought by a message of President Washington; but in Georgia it aroused especial indignation, for there was strong evidence of legislative corruption. The members of the Legislature of 1796 came pledged to repudiate the whole transaction. All acts authorizing the sale were repealed, the purchase-money paid was ordered to be returned, and the records of the transaction were publicly burned. In 1802 Georgia ceded all this western territory to the U. S., and the Federal Government subsequently recommended that the claimants be compensated in land or money. The popular feeling, however, against the transaction prevented any action by Congress. The claimants finally sought their remedy in the U. S. courts, and the case was carried by appeal to the Supreme Court of the U. S. In *Fletcher* vs. *Peck*, Chief Justice Marshall in 1810 held that the original sale by the State of Georgia must be sustained; that the allegation of corruption on the part of the Legislature could not be entertained by the court; that purchasers from the land companies were innocent holders without notice; that the repealing act of the Georgia Legislature could not divest them of the rights thus acquired. Consequently, in 1814 Congress appropriated $5,000,000, to be raised by the sales of the lands, to quiet and extinguish all the Yazoo claims.

Revised by F. M. COLBY.

Yazoo River [the name signifies "River of death" in the Choctaw language, alluding to the malarial diseases which prevailed upon its shores]: a navigable stream of Mississippi. It originates in the Yazoo Pass, Coldwater river, Beaver Dam river, and other bayous and sloughs springing from the east bank of Mississippi river. These join the Tallahatchie, a navigable stream from the N. E., at Polkville, Miss., where the Yockeney also comes in from the E., but the united stream is generally called the Tallahatchie down to the junction with the Yalabusha, which is also navigable. The Yazoo proper below this point is 290 miles long, deep, serpentine and sluggish, and navigable the year round. It joins the Mississippi 12 miles above Vicksburg. Revised by I. C. RUSSELL.

Yberá, or Iberá, Laguna: See CORRIENTES.

Yberville: another spelling of Iberville. See IBERVILLE, D'.

Yca: another form of ICA (*q. v.*).

Year [M. Eng. *yer* < O. Eng. *yēar*: O. H. Germ. *jār* (> Mod. Germ. *jahr*): Icel. *ār* < Teuton. *yēr-* < Indo-Eur. *i̯ēr-*, *i̯ōr-* > Gr. ὥρα, season, ὥρος, year: Zend. *yāre*]: a full round of the seasons. While this, the original conception of the year, remains unaltered, as defining the principal year still used in astronomy, circumstances have led to a number of different years which we may regard as branching off from the main conception. When a system of astronomy was first formed it was seen that the solar year was determined by the apparent revolution of the sun around the earth, which we now know to be due to a real revolution of the earth around the sun. But this revolution may be reckoned in various slightly different ways, according as we refer the motion of the earth to the equinox, or to the earth's perihelion. Again, the year was found to be approximately twelve months, and thus various years were formed from the length of twelve months of different kinds.

On the subject of the years practically used in chronology information will be found in the article CHRONOLOGY (*q. v.*). The present article is limited to a brief statement of the characteristics of the principal years.

First of all, there is the solar, tropical, or equinoctial year, defined as the mean interval between two returns of the sun to the vernal equinox. The length of this year is 365 days 5 hours 48 minutes 46 seconds, and it diminishes about half a second in a century owing to a change in the annual precession of the equinoxes. Since the apparent motion of the sun or the real motion of the earth, relative to the equinox, determines the changes of the seasons, we may regard this year as the principal one for the practical purposes of life. It is also the principal year for astronomical purposes, because it corresponds to one revolution of the earth in longitude.

In consequence of precession the equinoxes are in constant motion from E. toward W. among the stars. Hence the return of the sun (or earth) to the equinox takes place in a somewhat shorter space than its return to a line drawn toward the same star. The former period is a little less than 365¼ days; the latter a little greater. The mean interval between the return of the sun to the same star is called a sidereal year, and its length is 365 days 6 hours 9 minutes 9·5 seconds. The anomalistic year is the interval between two returns of the earth to its perihelion; it has no special importance in ordinary life.

The years which have branched off, as it were, from the solar year are, principally, our "common year" of 365 days, and leap-year, or bissextile year, of 366 days. The Julian year is one-fourth the length of four consecutive years of the Julian calendar, or 365¼ days.

A "lunar year" of twelve lunar months, or 354 days nearly, was sometimes used by nations whose religious feasts were regulated by the moon, notably by the Mohammedans.

Different peoples have differed widely as to the place among the seasons of the beginning of the year. The Roman year, before the time of Julius Cæsar, began on Mar. 1. The civil year of the Jews began at the autumnal equinox, though their sacred year began at the vernal. The Greek year, before the time of Meton, began at the winter solstice; afterward at the summer solstice. The Egyptians, Persians, and other Eastern peoples began, like the Jews, at the autumnal equinox. The Mohammedan year, being a lunar year, has no determinate epoch, but continually goes backward among the seasons. Sept. 1 was the beginning of the year in the Eastern empire, and the same was true in Russia before the time of Peter the Great. In France, under the Merovingian kings, the year began Mar. 1; under the Carlovingians, Mar. 25; under the Capetians, at Easter; and after 1564 on Jan. 1. The ancient northern nations of Europe placed the beginning of the year at the winter solstice. In England the year began on Mar. 25 previously to the adoption of the Gregorian calendar, which took place in 1752. The same usage prevailed in the British American colonies from Nova Scotia to Georgia, and was abandoned at the same time. For the Church year, see CALENDAR (*Ecclesiastical Calendar*). S. NEWCOMB.

Year and a Day: a complete calendar year. The day was added because the common law recognized no parts of a day, and therefore treated the last day of any period as ending at the very moment of its beginning. In accordance with this rule an INFANT (*q. v.*) attained full age at the beginning of the last day of his twenty-first year. The period of a full year, or of "a year and a day," was adopted as an arbitrary limit in many cases. By the feudal law the heir of the tenant was required to claim within that period, or he lost his land. The same limitation was imposed upon the claim of a tenant against his disseisor; and upon that

of the owner of an estray, or of the owner of wrecked property, or upon the issuing of an execution on a judgment. In order to make felonious killing murder, the common law required that the injured party should die within a year and a day after the mortal injury was inflicted. The reason assigned for this rule was that if the person alleged to have been murdered die after that time it can not be discerned, as the law presumes, whether he died of the injury or a natural death; and in a case involving life a rule of law ought to be certain. This rule has no application to a civil action for damages sustained by the widow and next of kin of one whose death was negligently caused by the defendant. FRANCIS M. BURDICK.

Year-books: the oldest English law reports extant, so called because published annually, and termed by old writers "books of the years and terms." They are valuable and interesting from an antiquarian and historical point of view, and to some extent to the practicing lawyer, though seldom resorted to as guides for modern decisions. Instances, however, may be found in which they are consulted. (See the cases of *Lumley* vs. *Gye*, 2 Ellis & Blackburn, 216; *Curtis* vs. *Hubbard*, 4 Hill (New York), 437; *Althorf* vs. *Wolfe*, 22 New York Reports, 366, 367.) Until recently the year-books, as generally known to the legal profession, consisted of an edition in the Norman French published by Sergeant Maynard (1678–80), beginning with the reign of Edward I. and coming down to the time of Henry VIII. The collection was an imperfect one, a number of the early reports still remaining in a manuscript form; but the reports for a number of the years have now been carefully edited and published in English.

Revised by F. STURGES ALLEN.

Yeast: See FERMENTATION.

Yeast-plants: the *Saccharomycetaceæ*; much degraded and simplified sac-fungi, found abundantly in fermenting fluids. They are usually reduced to single, rounded cells, although under favorable conditions they may form several —or many—celled threads. They increase by pullulation from the end or side of the cell, the outgrowth eventually separating as a new cell. This process may take place with much rapidity, as in case of ordinary bakers' yeast. Occasionally the cell becomes an ascus and forms four ascospores. The family is now placed in the order *Discomyceteæ*, near to the *Gymnoascaceæ*. It includes the single genus *Saccharomyces*, with about twenty-five species. One of the most common is that used by bakers and brewers, *S. cerevisiæ*. See FERMENTATION, FUNGI, and VEGETABLE KINGDOM. CHARLES E. BESSEY.

Yedo: See TOKIO.

Yeisk: another spelling of JEISK (*q. v.*).

Yekaterinboorg, Yekaterinodar, Yekaterinoslav, Yelets: another spelling of EKATERINBURG, EKATERINODAR, EKATERINOSLAF, ELETS (*qq. v.*).

Yelk: See YOLK.

Yellow-bird: the common name given in the U. S. to two varieties of birds, the American goldfinch (*Spinus tristis*) and the yellow warbler or summer yellow-bird (*Dendroica æstiva*).

Yellow-eyed Grass: the common name of the *Xyridaceæ*; a family of monocotyledons chiefly consisting of the *Xyris*, a genus of biennial or perennial rush-like plants with two-edged, sword-shaped leaves. More than fifty species have been described, and fifteen are found in the Northern U. S., chiefly in sandy swamps and pine-barrens.

Yellow Fever: a disease so called because of the peculiar yellow tinge of the skin characterizing it, and for the same reason technically designated *typhus icterode*, *icterus* being the classical name of "yellow jaundice." It is not a form of typhus fever, but resembles it in the prostration, blood-disorganization, and softening of internal organs which are features in both. Yellow fever prevails chiefly in tropical and warm climates. When occurring in temperate or cold zones, it has been imported in the course of commercial travel. It is indigenous chiefly in the West Indies, upper coasts of South America, and the borders of the Gulf of Mexico. It occurs in isolated, sporadic cases at all seasons in seaports, to which it has been transported in ships. Rigid quarantine of all ships coming from yellow-fever localities, and their fumigation before disembarking passengers and cargo, have averted the epidemics formerly so frequent. It is generally conceded that there is a specific morbific element, a portable *fomes* or infectious agent, which propagates this disease. This *materies morbi*, when imported and let loose, will prove innocuous unless the weather be warm or mild and the air moist. It rarely develops when the mercury is below 70° F., and frost or freezing weather effectually terminates its career. Insalubrious, damp, low, and filthy localities are more likely to be its points of successful lodgment. By the intercourse of business and personal visits it may be carried from the infected localities to other points, which in turn become foci of contagion. But there is no general atmospheric contamination, no infection, no contagion necessary, except as the air vitiated by the breath, vomit, and stools of the patient is inspired. The question of the direct contagiousness of yellow fever is still an open one. Opinion and what evidence there is upon this point would indicate that the disease is not directly transmitted from the sick to the well. Some intermediate development of the infectious agent in the soil or air seems to be necessary before it passes from one to another person. Yellow fever is not now regarded, as formerly, a fever of malarial origin, allied to intermittent and remittent. It prevails on the coasts and in large cities, sparing the contiguous country, which is often swampy and afflicted severely by malaria. The Negroes of the South, although susceptible to malaria, enjoy a relative immunity from yellow fever. Quinine and other anti-malarial remedies do not control it, or especially relieve it beyond their general tonic effect. In some cases, for two or three days or more, there will be general lassitude, loss of appetite, and sense of debility. In graver cases the attack may be precipitate and speedily fatal; reversely, there are "walking cases," in which, with jaundice and even mental disturbance, the muscular power is retained. There is usually an initial chill, headache, pains in the back and limbs, and slight increase of temperature. Exceptionally, the thermometer in the mouth or axilla will register a high degree, as in other fevers—103°, 104°, 105° F.—but more often the body-heat is but little elevated, and in some cases is lowered. After a few days, two or three, the temperature subsides and the symptoms abate. The patient may consider himself well, and indeed in abortive cases the disease terminates at this point. In most instances, however, a recrudescence follows after a day or two, and the graver symptoms of the disease, black vomit and delirium with general prostration, supervene. The pulse is but little accelerated. The stomach is irritable at an early date. The mind may be mildly or actively delirious. The skin grows yellow, and, when vomiting causes exhaustion and wasting, is often shriveled. The blood has become seriously impaired by the morbific poison, and its decomposed and watery elements tend to transude the coats of the vessels. Hence, with the effects of vomiting, vessels in the congested stomach are unloaded, and the already disorganized blood, being further perverted by the action of gastric juice, presents a coffee-ground, or again a tar-like, appearance, known as black vomit. This is regarded as a critical or even fatal sign; and with reason, since it is an evidence of serious destruction of red blood-cells. Exhaustion and collapse are the result of such conditions unless stimulating and sustaining treatment is assiduously adhered to. The average duration is a week. There is no specific treatment, but the bichloride of mercury has appeared to exercise some beneficial action. No depressing remedies should be employed. Cold and evaporating lotions to the head may prevent brain symptoms; ice, effervescing waters or champagne in small quantity, and other remedies for composing the stomach are valuable. Ammonium carbonate may help to oxygenate the blood. But quiet, discreet nursing, warm drinks, and blanketing, and, later, abundant nutrition, are found to be the most successful means of cure. The mortality varies with the character of the epidemic, the class of persons it has attacked, their hygienic surroundings, and the discretion with which cases are treated; it may be as low as 5 or as high as 75 per cent. See FILTH DISEASES. Revised by WILLIAM PEPPER.

Yellow Fibrous Tissue: See ELASTIC TISSUE.

Yellow-hammer: the *Emberiza citrinella*, a very common and handsome bunting of Europe and western Asia. In Italy it is fattened and eaten. In the U. S. the name is sometimes applied to the flicker, or golden-winged woodpecker, *Colaptes auratus*. Revised by F. A. LUCAS.

Yellowlegs: the *Totanus flavipes*, a North American snipe found all along the Atlantic coast of the U. S. It is a fine game-bird, and is esteemed by epicures.

Yellow Metal: See BRASS.

Yellow River (in Chinese *Hwang-Ho*; sometimes formerly spelled *Whang-ho* and *Hoang-ho*): one of the principal rivers of CHINA (*q. v.*); sometimes called "China's Sorrow," from its unruliness, and the destruction and loss of life caused by its frequent change of course and the bursting of its banks. Its principal affluent is the Wei. See SHENSI.

Yellows: See CHLOROSIS.

Yellow Sea (in Chinese *Hwang-hai*; formerly sometimes written *Whang-hai* and *Hoang-hai*): those waters of the Pacific Ocean which border on the Chinese provinces of Chehkiang, Kiang-su, Shantung, and Chih-li, and are discolored by the large amount of yellowish mud which the Hwang-ho and the Yang-tse-Kiang carry with them to the ocean. It is rather shallow and its depth is steadily diminishing.

Yellow Springs: village; Greene co., O.; on the Pitts., Cin., Chi. and St. L. Railway; 9 miles S. by W. of Springfield (for location, see map of Ohio, ref. 6–D). It derives its name from several mineral springs which have made it popular as a summer resort, and is the seat of ANTIOCH COLLEGE (*q. v.*). Pop. (1880) 1,377; (1890) 1,375; (1900) 1,371.

Yellowstone National Park: a reserved tract situated in the northwest corner of the State of Wyoming, with a strip of country less than 2 miles in width lying on the N. in Montana and a still narrower strip extending westward into Idaho. Its boundaries as determined by act of Congress setting apart the park are ill defined. That portion of the park which is most frequented by travelers lies S. of the 45th parallel of N. lat. and between the 110th and 111th meridians. It is a rugged country, embracing a little more than 3,300 sq. miles. For a long time it had remained an inaccessible land which had defied all efforts of explorers to cross it. Occasionally a venturesome mountaineer or trapper entered the country, but not until 1870 was there any trustworthy account of a journey through the central portion. Up to that time it remained the largest tract of unexplored country in the Rocky Mountains. In the summer of 1870 H. D. Washburne, surveyor-general of Montana, accompanied by Lieut. G. C. Doane, traversed the region and published the first detailed account of its marvels and scientific curiosities. In the following year Dr. Ferdinand V. Hayden, U. S. geologist, accompanied by a corps of scientific assistants, among whom were several topographical engineers and a photographer, visited the region. Upon his earnest solicitation Congress passed a law dedicating the park and defining its boundaries as a public park or pleasure-ground for the benefit and enjoyment of the people. The act was approved Mar. 1, 1872.

The central portion of the park is a broad volcanic plateau between 7,000 and 8,500 feet above sea-level, with an average elevation of 8,000 feet. Surrounding it on all sides are mountain ranges with prominent peaks and ridges rising from 2,000 to 4,000 feet above the general level of the inclosed table-land. The Gallatin Range shuts in the park on the N. and N. W. Electric Peak, in the extreme northwest corner of the park, forms the culminating point in the range, and attains an elevation of over 11,000 feet above sea-level. It affords one of the most extended views to be found in this part of the country, not only over the park but the broad valley of the Yellowstone. The range is one of great beauty, of diversified form, and picturesque scenery. Sedimentary rocks from the Cambrian to the top of the Cretaceous are represented. Large masses of eruptive rocks have penetrated through sedimentary strata.

South of the park the Tetons rise grandly above the surrounding country, and form the highest peaks in the northern Rocky Mountains. East of the Tetons across the broad valley of the upper Snake, generally known as Jackson Basin, lies the Wind River Range. Only northern outlying spurs of both these ranges extend into the park.

Along the east side the Absarokas stretch for 80 miles, a bold unbroken barrier to western progress. They are made up of volcanic rocks, the highest peaks and crags attaining elevations ranging from 10,000 to 11,000 feet above sea-level. At the northeast corner of the park an irregular mass of mountains unites the Absarokas with the Snowy Range. The latter incloses the park on the north, and is an exceptionally rough, broken country, with elevated mountain masses formed of Archæan crystalline schists and Tertiary lavas. These ranges are all geologically older than the relatively depressed region which they inclose, designated as the Park Plateau. This plateau is by no means a level country, but is accidented by broad shallow basins, and deeply scored by narrow gorges and cañons. The plateau represents a vast pile of lavas, in places 2,000 feet in depth, resting against and in part concealing the flanks of encircling mountains. Out of this plateau rise two prominent peaks, Mt. Washburne and Mt. Sheridan, from both of which have poured forth enormous masses of lavas. Across the plateau from the S. E. to the N. W. stretches the Continental Divide, separating the waters of the Atlantic from those of the Pacific. Several large bodies of water, notably Yellowstone, Shoshone, Lewis, and Heart Lakes, form such characteristic features on both sides of this divide that the southern end of the plateau has received the appellation of the lake region of the park. Hundreds of smaller lakes occupy irregular depressions either in lava flows or in shallow basins of glacial origin. Numerous streams coming down from the high mountains supply large quantities of water to these lakes and ponds. The Yellowstone and the Snake carry off the greater part of these waters, the former draining more than one-half the area of the park, and the latter the entire western side of the divide. The Yellowstone river, the longest branch of the Missouri, finds its source in Yellowstone Lake; the Snake, in Shoshone Lake. A volcanic ridge about 250 feet in height separates the two lakes. Bechler river drains the Pitchstone Plateau, a part of the Park Plateau lying W. of the main Snake. The Firehole and Gibbon unite to form the Madison, which carries off the greater part of the water upon the western side of the park, ultimately running into the Missouri. The Gardiner drains the eastern slopes of the Gallatin Range and adds its water to the Yellowstone, joining the latter near the northern line of the park.

Flora and Fauna.—About 85 per cent. of the park is forest clad; the bare portions are mainly areas above timberline, steep slopes, and wet marshy bottoms. The forest is essentially coniferous. A few groves of aspen (*Populus tremuloides*) add brilliancy to the autumnal foliage, but are insignificant in number. Over two-thirds of the trees are black pines (*Pinus murrayana*). On moist ground and where the snows remain late in the season this species gives way to the balsam (*Abies subalpina*) and the spruce (*Pinus engelmanni*). In a few localities the red fir (*Pseudotsuga douglassi*) is conspicuous by its height and vigor. The black pine rarely attains any great size, trees more than 2 or 3 feet in diameter being exceptional, while over considerable areas they are so diminutive as to be locally known as lodge-pole pine. The young forest is made up of graceful trees, but the maturer growth is not specially attractive. The charm of the forest is found in the natural groupings and park-like arrangement of the trees in the open country, many of those on the mountain slopes being of exquisite beauty. For grandeur these forests are not to be compared with those of the Sierra Nevada or Cascade Ranges. In the pine timber over much of the plateau there is little vegetation other than a low but luxuriant growth of blueberry (*Vaccinium myrtillus*).

From middle July to late September flowering plants everywhere abound, except in the forest. A peculiar flora is found in the region of the geysers and hot springs, due to the exceptional heat and moisture or to peculiarities of alkaline soil.

With the exception of the Rocky Mountain goat, all the larger game of the Rocky Mountains roam in the park. Elk, deer, and bear abound, antelope are found in the open valleys, sheep in the high country, and moose in the more marshy bottoms. A few small herds of buffalo roam over the park, grazing most of the time in out-of-the-way places. Since their protection by the Government, they are rapidly increasing.

Yellowstone Lake and Cañon.—Yellowstone Lake is a grand sheet of water, measuring 20 miles in length, with a breadth across its broadest expansion of 15 miles. It has an elevation of 7,741 feet above sea-level, and is the largest lake at so high an altitude in North America. Only a few lakes in the world at this altitude surpass it in size. It embraces an area of about 140 sq. miles, and it requires a ride of nearly 100 miles along the shore to complete the circuit.

After leaving the lake the Yellowstone river winds across Hayden valley, and then suddenly enters the cañon, a deep, narrow gorge cut in the plateau. The upper falls of the Yellowstone measure 110 feet, and a quarter of a mile below, the river plunges over the rocks in one bound for 310 feet. The cañon of the Yellowstone far excels in beauty all other marvelous sights in the park. From the lower

falls for 3 miles down the river the abrupt walls on both sides of the cañon, nearly 1,000 feet in depth, present a brilliancy and mingling of color beyond description. The cañon varies in width from a quarter to three-quarters of a mile. From the brink to the water's edge the walls are one mass of decomposed lava, presenting varied tints of orange and red, the result of steam and acid vapors upon the rhyolite. A number of small hot springs may still be seen in action in the bottom of the cañon only a short distance above the river. Numerous other deep gorges penetrate the lavas, carrying the waters of the plateau to the lower valleys. Geologically speaking, all these gorges are of recent origin. In most of them may be found waterfalls of great beauty; among them may be mentioned Tower, Undine, Osprey, Gibbon, Mystic, and Terrace falls.

Geysers and Hot Springs.—The natural objects that have made the Yellowstone region famous are mainly connected with its unequaled manifestations of thermal activity. Eruptions of lava ceased long ago; nevertheless over the Park Plateau evidences of internal heat are everywhere to be seen. Surface waters in percolating downward have become heated by relatively small quantities of steam rising through fissures from deep-seated hot rocks. Geysers and hot springs return these meteoric waters to the surface. (See THERMAL SPRINGS.) Geysers, mud-volcanoes, thermal springs, solfataras and steam-vents remain as active evidences of the dying out of volcanic energy. Innumerable localities of hot springs indicate the wide distribution of underground heat over the park. Large areas of decomposed lavas and extinct solfataras show the former existence of still greater thermal activity. The number of hot springs scattered over the park is nearly 4,000. If to these be added the fumaroles and fissures from which issue in the aggregate enormous volumes of steam, the number of active vents would be more than doubled. In the four principal geyser basins frequented by tourists (Norris, Midway, Upper and Lower Geyser Basin) eighty-four geysers are known to have been active since the days of the earliest exploration. To these may be added the geysers of the Shoshone Basin on the shores of Shoshone Lake, the Union Geyser, only a short distance from the lake, ranking among the finest in the park. In the neighborhood of Yellowstone and Heart Lakes are found a number of other geysers. Probably there are 100 geysers within the park.

All the thermal waters of the park may be classed under three heads: First, calcareous waters carrying calcium carbonate in solution; second, siliceous alkaline waters, rich in dissolved silica; third, siliceous acid waters, usually carrying free acid in solution.

Only at the mammoth Hot Springs do calcareous waters present an important feature. These springs lie in the extreme northern end of the park, just N. of the plateau. The waters reach the surface through Jurassic and Cretaceous limestones, and are strongly charged with calcium carbonate, which is rapidly deposited as travertine. The travertine covers an area of about 2 sq. miles, occupying a narrow valley lying between Sepulchre and Terrace Mountains. A continuous deposit extends from Gardiner river up to the top of Terrace Mountain, a vertical distance of 1,300 feet. The brilliant white travertine with its abrupt terraces presents the appearance of a glacier occupying a narrow mountain gorge. A series of terraces extend all the way from the river to the top of the mountain. The hotel terrace is the broadest of these level areas, and contains 83 acres. There is considerable range in temperature of the waters, the hottest springs reaching 165° F.

The siliceous waters are found mostly on the volcanic plateau issuing through cracks and fissures in the rhyolitic lavas from which they derive their mineral contents.

Acid waters occur in the Norris Basin, Crater Hills, Highland Springs, and on the slopes between Mt. Washburne and the Grand Cañon of the Yellowstone. They may be recognized by the efflorescent deposits of alum and salts of iron, and in general have an astringent taste. They are of less general interest than the alkaline siliceous waters, as it is only with the latter that the geysers are associated. Alkaline waters deposit mainly silica as siliceous sinter. It occurs as a surface incrustation of amorphous silica, and is usually spoken of as geyserite. It is white in color and covers large areas in all the geyser basins.

Geyser Basins.—The Norris Basin is situated 22 miles from the Mammoth Hot Springs. There are fourteen geysers in the basin, but none of them so impressive as those in the other basins.

The Lower Basin is 20 miles S. of the Norris Basin, and is the largest of all the geyser areas. It is roughly rectangular in shape, and contains innumerable hot springs and seventeen geysers, the largest of which is the Great Fountain. This is a typical geyser in every way.

On the west bank of the Firehole river, about 3 miles from the hotel in the Lower Basin, is Midway Basin. It is much the smallest of all the geyser areas, but contains the grandest geyser and the most picturesque hot lake to be found in the park. Excelsior Geyser is the most powerful geyser in the park. It throws into the air an enormous column of water 250 feet in height, measuring nearly 20 feet in diameter at the base, breaking into a fan-shaped body above. It rises from the center of a seething caldron of boiling water, the level of which lies about 20 feet below the surface of the sinter plain. At every eruption the amount of water thrown out reaches many thousand barrels. Frequently large blocks of sinter are hurled violently into the air by the force of the explosion. Prismatic Lake is unsurpassed for brilliancy of color and for the exquisite beauty of its rim.

From the Excelsior to the head of the Upper Geyser Basin, geysers and hot springs line the Firehole river. The Upper Basin is about 2½ miles long by 1¼ miles wide, and contains the greatest number and, with the exception of the Excelsior, the grandest geysers in the park. There are over forty, of which nine are of the very first order. The Giant, Giantess, Grand, Splendid, Grotto, Castle, Bee-hive, Oblong, and Old Faithful are all within a short distance of each other. Old Faithful was so named on account of its great regularity; for over twenty years it has been playing at intervals averaging sixty-five minutes. All the larger geysers throw columns of water varying from 70 to 250 feet.

Government of the Park.—The Yellowstone Park is under the supervision of the Secretary of the Interior, who is authorized to make all necessary rules and regulations for its government and protection. The superintendent is an army officer, with headquarters at the Mammoth Hot Springs. Nobody is allowed to reside permanently in the park without special permit. All shooting is strictly prohibited, and the capture and trapping of game is forbidden. Fishing for pleasure and for food while in the park is permitted, but is strictly prohibited for commercial purposes. Every precaution is taken to prevent forest fires. There are several hotels in the park, and these are connected by good roads, maintained by the Government. ARNOLD HAGUE.

Yellow-wood: the valuable yellow timber of *Flindersia* (formerly *Oxleya*) *oxleyana*, a noble cedrelaceous tree of Eastern Australia. Also the wood of *Cladrastis tinctoria* (once called *Virgilia*), a beautiful leguminous tree, a native of Tennessee and Kentucky. L. H. B.

Yembu: See YAMBU.

Ye'men [Arab. *Yaman*, liter., on the right hand, south (to one facing east), hence the land south of Syria. The ancient mistranslation, as *Ara'bia Fe'lix* (Gr. εὐδαίμων), arises from the further meaning of lucky, fortunate, in the Arabic word]: a vilayet or province of the Ottoman empire in Arabia. It is bounded N. by Hedjaz, W. by the Red Sea, S. by the British protectorate of Aden. Its indefinite eastern boundaries are Hadramaut and the great Arabian desert. The coast-line is about 500 miles in length, and the total area between 70,000 and 80,000 sq. miles. It consists in part of a maritime lowland belt from 10 to 30 miles broad, mostly sandy and sterile, but in places tropically fertile, in part of table-land some 4,000 feet above the sea, and between these two of a chain of heavily wooded mountains running N. and S., with peaks from 6,000 to 8,000 feet high. Among these mountains are well-watered valleys and terraced slopes of great fertility. The population is variously estimated by conjecture at from 500,000 to 2,500,000. About 100 miles from the coast is the nominal capital, SANAA (*q. v.*), whose hereditary imam, a subject of the Ottoman empire, shares dominion with numerous chieftains more or less independent and powerful. The former capital, Hodeïda, a most unhealthful city, is the principal port of the vilayet. Other ports are Mocha, famous for its coffee, but now almost abandoned, and Loheia. Zebid, 15 miles from the sea, the seat of an influential Sunnite college, is the most important manufacturing town, supplying large quantities of colored cotton fabrics. In the highlands are the towns of Beit el-Fakih, an entrepôt of coffee, Taïz, Dhamar, Mareb, Khamir, Saadeh, and Abu Arish. The principal exports are coffee, skins, senna, indigo, gums, dates, tamarinds, and ivory.

The history of Yemen goes back to remote antiquity. The earliest inhabitants are supposed to have belonged to the Hamitic race. Descendants of the Semitic Sheba (Gen. x. 28) came afterward. From their amalgamation arose the celebrated Himyaritic kingdom about 700 B. C. The high civilization of this kingdom is attested by hundreds of inscriptions, coins, and works of art. Various attempts at conversion of the country to Christianity, as by Theophilus, a missionary sent by Constantius II. in 356, had small permanent result. The king Abu Novas, who reigned toward the end of the fifth century, professed Judaism and massacred the Christians. In consequence he was conquered by the Negus of Abyssinia (525), whom Justin I. had instigated to revenge his coreligionists. The Persians replaced the Abyssinians in 575, and the whole province submitted to Mohammed and Islam in 628. The Ottomans have exercised a precarious authority over Yemen since 1538. EDWIN A. GROSVENOR.

Yenikale, or **Jenikale**, yen-ĕĕ-kaa'lā, **Straits of** (anc. *Cimmerius Bosphorus*): the body of water connecting the Sea of Azof with the Black Sea. It is 19 miles long, about 3 miles wide where narrowest, and very shallow. The southern part is called Strait of Kertch. E. A. G.

Yenisei, yen-ĕĕ-sā'ĕĕ: the longest of the great rivers of Siberia, watering the immense Yeniseisk province through its whole length. It rises in the N. W. of Mongolia in several branches, the chief of which is the Ulukhern to the W. of Lake Kossogol, separated from it by the Khangai Mountains. Below Krasnoyarsk it receives a great tributary, the Kan, and farther N. the Angara, the Podkamennaja ("stony"), and the Nishnaja Tunguska, and empties into the Arctic in a deep estuary, the Yenisei indentation or the Liman of Seventy islands, ice-bound almost all the year round. Its total course is more than 3,000 miles long, and is navigable from Minusinsk, though there is a series of rapids in the middle course between Krasnojarsk and Yeniseisk. HERMANN SCHOENFELD.

Yeniseisk, yen-ĕĕ-sā'isk: one of the two great governments of Eastern Siberia (see SIBERIA) on both sides of the Yenisei river, extending from the Chinese frontier to the Arctic Ocean. Area, 987,186 sq. miles. It is very sparsely inhabited in the north by the Yuraks of Samoyede race and the Yakuts, in the south by Ostjaks, Tunguses, and Tartars. The northern part is mostly a frozen swamp or a desert plain; the southern part is very mountainous. The Sayans Mountains, connected with the Altai, which form the frontier between Russia and China, are very rich in gold, silver, iron, and all kinds of metals and minerals. The very common salt lakes yield about 50,000 cwt. of salt every year. Fishing in the great streams and lakes and hunting are the chief occupations of the half-savage natives. The Russian inhabitants are partly exiles, among whom there are nearly 50,000 so-called "settled" exiles, but mostly voluntary settlers, and are chiefly engaged in agriculture, cattle-raising, and the fur-trade. The total population of the government in 1897 was 567,807. Minusinsk is the granary of the province, and from it the gold-fields of the Yeniseisk Taiga are provided with grain and cattle by boats. The enormous government is divided into six districts. The capital is Krasnoyarsk, with 17,155 inhabitants; but perhaps more important is the town of Yeniseisk (see map of Asia, ref. 2–F), which has given its name to the government, being the chief entrepôt for the gold mines. At its fair in August the larger part of the Siberian fur-trade is concentrated. The town has a public library and a natural history museum created by exiles. Pop. (1888) 7,382. HERMANN SCHOENFELD.

Yeomanry Cavalry: a body of British volunteers, not reckoned as militia, and liable to duty only in Great Britain. They are organized by counties under the lords-lieutenants, and can be called out to assist the civil power or to serve against an invader; while serving they are on the same footing as regular soldiers. The yeomanry were first organized in 1797, and originally comprised infantry, but are now composed entirely of cavalry. In 1894–95 they numbered 11,790.

Yeomen of the Guard: properly "His (or Her) Majesty's Body-guard of the Yeomen of the Guard," a body of 100 veteran soldiers, commanded by a captain (a nobleman), a lieutenant, an ensign, an adjutant, and four exons (probably a form of the word exempt), all old soldiers, besides non-commissioned officers. They were instituted in 1485 by Henry VII., and are employed on special occasions as a body-guard of the sovereign.

Yes'digerd III.: Persian king; the last of the dynasty of the SASSANIDÆ (*q. v.*); b. in 617; ascended the throne in 632. In 634 he repulsed the Mussulmans under Abou Obeïda, but was defeated in the three days' battle of Cadesiah (636), after which his capital, Ctesiphon, was taken and destroyed. Again defeated at the decisive battle of Nehavend (641), all Persia was subdued by the caliph. Yesdigerd maintained a hopeless resistance till 651, when he was assassinated by a perfidious host. E. A. G.

Yesso: See YEZO.

Yew [M. Eng. *ew* < O. Eng. *ēow*, *īw*: O. H. Germ. *īwa* (> Mod. Germ. *eibe*): Icel. *ȳr*. Fr. *if*, Span. *iva*, yew, are of Teuton. source]: the common name of evergreen coniferous trees of the genus *Taxus*, and sometimes extended to others of the family *Taxeæ*, now generally included in *Coniferæ*. Thus TORREYA (*q. v.*) is called stinking yew, etc. The common yew-tree (*T. baccata*) of Europe is often planted in churchyards, and, like the cypress and willow, has a funereal character well supported by its gloomy appearance. Its leaves and seeds are poisonous. Its tough wood was once in great repute for bows. It is very hard, elastic, and durable. The tree is slow-growing and is famous for its longevity. Of its varieties the Irish yew is the finest. *T. canadensis* is a prostrate American sort, very commou northward.

Yezd, or **Jesd**: town: in Central Persia (see map of Persia and Arabia, ref. 3–I). It is situated in a small oasis, watered by the river Mehris, and produces excellent fruits and vegetables. Grain has to be brought from Ispahan. Though the town appears a mass of ruins, it manufactures arms and silk and velvet stuffs, and has well-stocked bazaars. It is the junction of the main Persian caravan routes. Among its inhabitants are Parsees and numerous Jews. Pop. about 40,000. E. A. G.

Yezidees: See DEVIL-WORSHIPERS.

Yezo, yā'zō, less correctly **Yesso**, and known by the Japanese as **Hokkaido**: the most northerly of the great islands of Japan, and until recently treated as a colony; extending from the Straits of Tsugaru on the S. to the Soya Strait on the N., i. e. between parallels 41½° and 45½°, N. lat. and 139½° and 146° of E. lon. Its area, with small adjacent islands, is 30,276 sq. miles. The surface of the country is broken and mountainous, and a large portion remains imperfectly explored. The highest summit, forming the center of the river system, is Mt. Tokachi, 8,200 feet in height. The chief river is the Ishikari, flowing W. into the Japan Sea, a stream abounding in salmon. About the year 1600 A. D. the southwestern peninsula began to be settled by Japanese, and the town of MATSUMAYE (*q. v.*) remained the center of rule until the year 1868. HAKODATE (*q. v.*), however, with its magnificent harbor, is the most important town on the island. It was thinly settled, and the new rulers of Japan, fearing Russian aggression, undertook a comprehensive colonization scheme. A special department, the Kaitakushi, was founded, and a number of Americans, with Gen. Horace Capron at their head, were in 1871 engaged as advisers. Making SAPPORO (*q. v.*) its headquarters, the department spent large sums on internal improvements, but as no adequate returns followed this expenditure, and few colonists were attracted, the Kaitakushi was dissolved in 1881, and the island divided into prefectures like the rest of Japan. Military colonists were settled all around Sapporo; a penal settlement was established close to Poronai; Mororan on Volcano Bay, with its landlocked harbor, became a naval station, and considerable progress was made in opening up the island. But the interior still remains for the most part covered with primeval forest, inhabited by deer and bears. For six months of the year the island is under ice and snow, the depth of the snow ranging from 2 feet in Hakodate to 6 or 8 feet on the N. and W. of the island. The summers though short are hot, and insect life abounds in the shape of mosquitoes and gadflies. The chief Aino villages are found on the southeast coast, the west coast immediately N. of Matsumaye being settled by a Japanese fishing population. Pop. (1894) 339,455, of whom about 14,000 are Ainu or AINOS (*q. v.*). J. M. DIXON.

Yg'drasil [from Icel. *Yggdra Syll*; (apparently) *Yggr*, a name of Odin + *syll*, sill, support]: in Scandinavian mythology, the greatest and most sublime of all trees, the ash, whose branches spread over all the world and aspire above heaven itself. It is the symbol of the universe. Beneath one of its roots is the fountain of wisdom and beneath

another is the meeting-place of the gods. Odin once hung nine days and nine nights in this tree sacrificing himself to himself. It is believed that Ygdrasil is the origin of the Christmas-tree. See SCANDINAVIAN MYTHOLOGY. See also Anderson's *Norse Mythology*. RASMUS B. ANDERSON.

Yncas: another spelling of INCAS (*q. v.*).

Yoga Philosophy: one of the six orthodox systems of India. (See NYĀYA, VAIÇESHIKA, MĪMĀṄSĀ, VEDĀNTA, SĀNKHYA.) Since ancient times, the belief has passed current in India that by the practice of asceticism or self-castigation a man could acquire supernatural powers, by which he could change at will the ordinary course of nature. Indeed, this idea has possessed the Indic Aryans as have few others; and they have accepted it quite as a matter of course. The Sanskrit word for asceticism is *tapas*, literally, heat, then pain, torment, and so self-torment; and it occurs as early even as in the younger hymns of the Rigveda, and then more frequently in the Yajurveda and the Atharvaveda; while the word and the thing are in full vogue in the literature of the next period, the Brāhmaṇas and Upanishads. Here, indeed, *tapas* is often treated as a cosmogonic potency, by means of which the creator of the world produces things and living beings. This is the best proof we could have of the fact that even in these ancient times the power ascribed to *tapas* was hardly less than that claimed for it in the later or classical Sanskrit literature. Here the belief finds most extravagant expression; even the gods fall a-trembling with horror and fear before the power of the ascetic (*tāpasa*), who is depicted as an omnipotent magician. Originally, the Indic *tapas* consisted doubtless merely in continence, fasting, and mortification. Later the religious needs of the people were no longer to be satisfied by the performance of endless ceremonies and by innumerable outward observances; and these changes are duly reflected in the system of *tapas*, whose principal features came to be meditation and intent contemplation. This spiritual *tapas* gets the name of *yoga*, and comes into the foreground; while the word *tapas* continues to mean as before, simply bodily mortification, and *tapas* itself is relegated to the subordinate position of an auxiliary, or of a means for the intensification of *yoga* proper. We may note in passing that Buddhism rejected *tapas* altogether, but laid great weight upon the intent contemplations. Naturally the ideas proper to the words *tapas* and *yoga* were not in the sequel always sharply distinguished. The word *yoga*, as meaning the closing of the senses to the outer world and the introversion and concentration of the mind, does not occur until considerably later than *tapas*; but it does indeed occur with tolerable frequency in the Upanishads, which are of the middle class as respects their age; and in the Maitrī Upanishad (at vi., 18), we find almost completely developed the technique prescribed for the practice of *yoga* by the later system.

The establishment of the Yoga philosophy is ascribed to Patañjali, but his work was in part simply the reduction to fixed literary form of views that had long prevailed in India. This reduction the writer of this article would refer to the second century before Christ, being persuaded of the correctness of the Indic tradition which identifies the philosopher Patañjali with the grammarian of the same name who flourished about 143 B. C. (See SANSKRIT LITERATURE.) His doctrines are contained in the compendium called Yoga-sūtra; and doubtless this is older than any of the compendiums of the five other systems. And this is to be inferred from the fact (until now unnoticed) that the Yoga-sūtra is the only one among the philosophical Sūtras which develops its system without entering into polemics against the other systems. Since now the oldest two of the other five, namely, the Mīmāṅsā-sūtra and the Vedānta-sūtra, date from the beginning of the vulgar era, or from a time not long anterior (see VEDĀNTA), and since the Yoga-sūtra antedates them, it is clear that the time of the great grammarian is an extremely probable one for the composition of the Yoga-sūtra. And this consideration greatly strengthens the probability of the correctness of the native identification.

The basis of the Yoga system is the Sānkhya philosophy. (See SĀNKHYA.) Indeed Patañjali has appropriated Sānkhya doctrines to such an extent that his system is generally and justly designated in Indic literature as a branch of the Sānkhya. All of the most important Sānkhya doctrines, except the denial of a God, are transferred to the Yoga system; to wit, the Sānkhyan theory of cognition, the Sānkhyan cosmology, physiology, and psychology, and the Sānkhyan theory that the deliverance of the soul from the round of existences is to be attained only by direct recognition of the absolute difference of *spirit* from matter. (The belief in the metempsychosis and in karma belongs, of course, to Aryan India in general.) The admission of the doctrine of a personal God into the Yoga system became in later times a fact of decided importance in determining the character of the system. But its original insertion by Patañjali, to judge from the Yoga-sūtra, was made in a way so loose-jointed as not to involve any essential modification of the contents and aim of the Sānkhyan system as a whole. Indeed, we may make the downright assertion that the Yoga-sūtras, i., 23–27, and ii., 1 and 45, which treat of God, are quite out of connection with the remaining portions of the compendium, and even in contradiction with the fundamental principles of the system. The ultimate end of human strivings is, according to the Yoga-sūtra, not union with God or a merging into God, but rather, as in the Sānkhya, simply the complete isolation (*kāivalya*) of the soul from matter, and the bringing about of an absolutely unconscious condition after the mundane existence. The statement is sometimes found in works on the history of Indic thought that the Yoga system is purely theistic, and that it assumes a primeval spirit from which the individual spirits originate, and the like. But this is completely erroneous. The individual souls are as truly without beginning and eternal as is the "particular soul" (*purusha-viçesha*), called "God." It is probable that Patañjali, by his very superficial erasure of atheism, simply intended to render the originally non-Brahmanical Sānkhya system more acceptable to his countrymen.

In this connection we must add that there is a large number of Upanishads which treat of *yoga*, and which are all much posterior to the oldest Upanishads, and probably even to the Yoga-sūtra also. They are those which Prof. Weber, in his *History of Indian Literature*, designates as the second class of Atharvan Upanishads. They have for their subject the sinking of the soul in contemplation of the Atman (that is the divine soul); and are, for the rest, somewhat affected by Vedāntic views. The conception of a personal God is well developed in them; and the like is true in still larger measure in the third and most recent class of Upanishads, the sectarian Upanishads, which substitute one of the forms of Vishṇu or Shiva for the Atman, while still following in essentials the Yoga doctrine.

There is one other important matter, besides that of the admission of a personal God, in which the Yoga is distinguished from the Sānkhya, to wit, the doctrine of *yoga*, from which the system receives its name. Patañjali treats this subject systematically; describes the means for attaining to this condition of concentration of thought or absorption, and the means for intensifying it to the highest degree, and the supernatural powers which are the reward of the practice of *yoga*. The practice of *yoga* has eight component parts (*yogāṅga*): (1) Self-control and the repression of all sensual impulses (*yama*); (2) the keeping of prescribed observances (*niyama*); (3) the remaining in certain bodily postures (*āsana*); (4) artificial restraint or regulation of the breath (*prāṇāyāma*); (5) the diversion of the senses from the objects of sense (*pratyāhāra*); (6) the composing of one's self, or attainment of self-composure (*dhāraṇā*); (7) meditation (*dhyāna*); and (8) intent or profound contemplation (*samādhi*). The belief prevails even to this day in Brahmanical India that by the successful practice of *yoga* one can attain the supernatural powers (*siddhi, āiçvarya*). The Yogins, i. e. the ascetics who practice *yoga*, do not, it is true, give any public proof of their possession of supernatural powers; but this is easily explained by the fact that it is an essential condition of their attainment that the Yogin be absolutely indifferent to the world of sense, and hence have no motive for exhibiting the miraculous powers. These are eight in number: (1) The power of making one's self infinitesimally small, or invisible (*aṇiman*); (2, 3) the power of making one's self exceedingly light (*laghiman*), or heavy (*gariman*); (4) the power of reaching anything whatsoever, for example, the moon, with the tips of one's fingers (*prāpti*); (5) irresistible power of will (*prākāmya*); (6) "lordship" (*īçitva*) over all beings; (7) the power of changing the course of nature (*vaçitva*); (8) the power of transporting one's self to any place soever by mere exercise of the will (*yatrakāmāvasāyitva*).

But the acquisition of the supernatural powers is not the only fruit of the practice of *yoga*, according to Patañjali; this practice is also the most successful means of overcom-

ing the hindrances to the attainment of the "redeeming knowledge" which springs from our own natural disposition. When concentration is so intensified that it is no longer possible for the thoughts to wander, nor for the faulty tendencies of the organ of thought to work themselves out, then comes the "knowledge of the absolute difference of spirit from matter" in the form of an "intuitive perception" (*pratibhā*). Such "knowledge" is tantamount to salvation; and in this way, accordingly, *yoga* is also the most certain means of attaining supreme deliverance or salvation.

There is an excellent commentary to the Yoga-sūtra by Vyāsa (of the seventh century after Christ), and this in turn was annotated by Vāchaspatimiçra (twelfth century); and by Vijñānabhikshu (after 1550) in his Yogavārttika. There is also a commentary on the Sūtra, entitled Rājamārtaṇḍa, and ascribed to King Bhoja (about 1000 A. D.). Of Vyāsa's commentary there are various Hindu editions with Vāchaspatimiçra's sub-commentary. The Yogavārttika was published at Benares in 1884. An edition and English version of the Yoga-sūtra with Bhoja's commentary was published by Rājendralāla Mitra in the *Bibliotheca Indica* (Calcutta, 1883). RICHARD GARBE.

Translated by CHARLES R. LANMAN.

Yokohama, yō′kō′haa′maä′: an important town and seaport of Japan; on the west shore of the Bay of Tokio; about 18 miles S. of the capital, with which it is connected by rail (see map of Japan, ref. 6–E). The town sprang up almost by accident at the time of the opening of the country, the original treaty-port being KANAGAWA (*q. v.*), on the north shore of a small bay, now closed in. Impatient of the obstructions placed in the way of their securing ground for their warehouses, foreign merchants established themselves at the small fishing-village of Yokohama (lit., cross-beach), 2 miles distant by water. The town divides itself into three parts: (1) the "native town," (2) the foreign settlement where the foreign business houses are, and (3) the Bluff, a well-wooded hill to the south of the settlement. The native town and the settlement are built on flat ground, at one time mostly a marsh or swamp. Most of the foreign private residences are on the Bluff. There is a good roadstead; a harbor, suitable for the accommodation of the largest vessels, is now in course of construction, and a graving-dock is also to be constructed. Yokohama is the chief port of foreign entry in Japan; during the year 1892 the tonnage of the vessels entering the port amounted to 1,910,191 tons (exclusive of junks). It is also the chief silk emporium; in the year 1892 2,800,000 lb. went to Europe and 4,400,000 to America. As a tea emporium it is yielding to Hiogo; 29,301,969 lb. were exported in 1892. The chief imports are cotton yarns, sugar, kerosene, woolens, bar iron, wire nails. Yokohama is on the main line of railway between Tokio and Kioto. The foreign consuls-general are established here, and several of the legations. In Dec., 1894, the native population numbered 160,439, the houses occupied by them 29,774. The foreign population, not Asiatic, numbers about 1,600, of whom one-half are British; until the war with China in 1894–95 the Chinese population numbered about 3,400. J. M. DIXON.

Yokosŭka, yō-kos′kaä′: a town of Japan; on the west shore of the bay of Tokio; about 12 miles S. of Yokohama (see map of Japan, ref. 6–E). Here is situated a great naval arsenal, with the best dry docks in the empire, and large ship-building yards from which armored vessels have been launched. The harbor is landlocked; there is hourly communication by sea with Yokohama. A branch line from KAMAKURA (*q. v.*) connects it by rail with that seaport and the capital. About a mile off is the grave of the English pilot, Will Adams, who, arriving in the country in 1600, remained in the service of the shōgun, prospered, and died in 1620. Pop. (1894) 20,443. J. M. DIXON.

Yolk, or **Yelk** [M. Eng. *yolke, yelke* < O. Eng. *geoloca, geoleca*, deriv. of *geolu*, yellow: Germ. *gelb*]: the food material stored up in the eggs of various animals. In contrast to the active protoplasm it is often termed deutoplasm. It consists of an albuminoid oily substance divided into globules, granules, or placques, usually suspended in a network of protoplasm. In many eggs it is white or colorless and this is true of the yolk in the early stages of the formation of the eggs of birds. In these latter, however, it later assumes the yellow color to which the name is due. In other cases it may be red, green, purple, etc. Yolk is coagulated by heat and by various chemicals. Under the influence of protoplasm it is altered into protoplasm, and utilized in the building up of the embryo. The amount and distribution of the yolk varies greatly in different eggs, and the early features of the development of the embryo are greatly modified according to these conditions. J. S. K.

Yonge, yŭng, CHARLOTTE MARY: novelist and miscellaneous writer; b. at Otterbourne, Hampshire, England, 1823; has published more than thirty novels, usually characterized by "High Church" religious tendencies, several works of history and biography, chiefly for the young, and some miscellaneous works, in all more than 100 volumes, not including those edited or translated. The most popular of her novels were *The Heir of Redclyffe* (2 vols., 1853; 17th ed., illustrated, 1868) and *Daisy Chain, or Aspirations* (2 vols., 1856; 9th ed., illustrated, 1868). The profits of the former were largely devoted to fitting out for Bishop Selwyn of New Zealand the missionary schooner Southern Cross, and those of the latter work, amounting to £2,000, were devoted to the erection of a missionary college at Auckland, New Zealand. Among her historical and miscellaneous books are *The Kings of England* (1848; 7th ed. 1862); *Landmarks of History, Ancient, Middle Ages, and Modern* (3 vols., 1852–57); *Cameos from English History* (1868); *Stories of English History* (1874); *The Book of Golden Deeds* (1864); *The Book of Worthies* (1869); *The History of Christian Names* (2 vols., 1863); *The Story of English Missionary Workers* (1871); *The Life of John Coleridge Patteson, Missionary Bishop of the Melanesian Islands* (2 vols., 1873); *A Modern Telemachus* (1886); and *The Victorian Half Century* (1887). She was joint author, with Miss Elizabeth M. Sewell, of *Historical Extracts* (1868), and was the editor of *The Monthly Packet*. An illustrated edition of her more popular works was issued in 1888–89 (35 volumes).

Revised by H. A. BEERS.

Yonkers: city (officially named in 1788, incorporated as a village in 1855, chartered as a city in 1872); Westchester co., N. Y.; on the Hudson and Bronx rivers, and the N. Y. Cent. and Hud. River Railroad; 18 miles N. of the New York city-hall (for location, see map of New York, ref. 8–J). It has a frontage of more than 4 miles on the Hudson river, extends eastward for 6½ miles along the Bronx river, and is built on a series of terraces which rise from the Hudson to a height of 425 feet above tide-water. The city is noted for its beautiful residences and for its manufacturing interests. Among the notable buildings are the city-hall, formerly the Philipse Manor, built in 1752, and used for municipal purposes since 1868; the Leake and Watts Orphan Home; the Hebrew Home for the Aged and Infirm; and "Greystone," which was the suburban residence of Samuel J. Tilden. There are 25 churches, viz.: Methodist Episcopal, 5; Roman Catholic, 4; Presbyterian, 4; Baptist, 3; Protestant Episcopal, 4; Reformed, 2; Congregational, 1; German Lutheran, 1; and Jewish, 1. Public organizations include a Young Men's Christian Association, a Women's Christian Temperance Union, and the Woman's Institute for aiding self-supporting women. A public library is installed in the High School building, and near the city-hall is a soldiers' monument. The principal industries are the manufacture of carpets and hats (each having two large plants), elevators, refined sugar, maltine, tools, chemicals, and insulated goods, and the handling of grain, for which there is a large elevator. In 1895 there were 2 national banks with combined capital of $250,000, 2 savings-banks, and 2 daily and 4 weekly newspapers. Pop. (1880) 18,892; (1890) 32,033; (1900) 47,931. EDWIN A. OLIVER, OF "THE STATESMAN."

Yonne, yon: department of Northeastern France; on both sides of the river Yonne; area, 2,868 sq. miles. The soil is very fertile, producing wheat, many vegetables, and excellent wine. There are fine forests and pastures. Iron, ocher, marble, and lithographic stones are produced, and different kinds of manufactures carried on. Pop. (1896) 332,656. Capital, Auxerre.

Yoritomo, yō′rĕĕ′tō′mō′: the personal name of Minamoto Yoritomo, one of the great warriors and statesmen of Japan; b. in 1146 A. D. When the Minamoto party was overthrown, Yoritomo, who was then an infant, was spared in the great massacre which followed. In 1180 he eluded the vigilance of his guardians, took up arms, and finally succeeded in 1185 in overthrowing the powerful Taira party. He was appointed shogun in 1192, and became the real master of Japan, organizing the military feudalism which, superseding an officialdom after the Chinese model, lasted till 1868. Kamekura, 12 miles W. of Yokohama, became the seat of his government. D. in 1199. J. M. DIXON.

York, or **Yorkshire**: largest county of England, extending along the North Sea from the mouth of the Tees in the north to the estuary of the Humber in the south, bounded by Westmoreland and Durham on the N., by Lancashire on the W., by Cheshire, Derbyshire, and Notts on the S., and Lincoln on the S. E. Area, 6,067 sq. miles. It is divided into three ridings—North, East, and West—each with its own lord-lieutenant, magistracy, and constabulary. Certain subdivisions of the county are known as shires, such as Hallamshire, Richmondshire, Allertonshire, etc. The surface is greatly diversified, but the soil is mostly fertile, and has been rendered still more productive by a most careful cultivation. The northern part is mountainous, and contains the highest mountains of England. Here are excellent pastures, rich mines of alum and lead, and extensive quarries of marble. The central part is a broad valley stretching from N. to S. and well suited for agriculture; wheat of superior quality is raised here. Extensive coal-beds are found in several places, and a manufacturing industry of the greatest importance is carried on in Leeds, Sheffield, and other large towns of the county. Pop. (1891) 3,208,812. Capital, York.

York (Lat. *Eboracum*): capital of Yorkshire, at the confluence of the Ouse and the Foss; 188 miles N. of London by rail (see map of England, ref. 6–I). It is one of the oldest and—on account of its monuments—most interesting cities of England. It is surrounded with walls, 2¾ miles in circuit, dating mainly from the reign of Edward III., and is generally closely built, with narrow streets and curious, old-fashioned houses. Its cathedral, built from the eleventh to the fourteenth century, is one of the finest specimens of Gothic architecture in the world. It is built in the form of a cross, 524 feet long, 250 feet broad across the transepts, with a square, massive tower, 216 feet high, rising over the crossing, and two elegant towers, 201 feet high, flanking the western front. Many of its other churches and public buildings are also fine edifices. The castle, in which the assize courts are still held, dates from the reign of Edward I. The manufactures and trade of York are not important. It is the seat of the Archbishop of York, whose residence is at Bishopthorpe, a short distance from the city, while the old archiepiscopal palace, N. of the cathedral and built in the twelfth century, is used as a library. In the time of the Romans, York was the seat of the general government for the whole province of Britannia; Septimius Severus and Constantius Chlorus died here, and here Constantine the Great was proclaimed emperor. In the Saxon period it was the capital of Northumbria, and afterward of Deira, and in connection with the Scots and the Danes it offered a fierce resistance to William the Conqueror, who after taking it razed it to the ground. It was only partially rebuilt, and suffered much by fire in 1137. York returns two members to Parliament. Pop. (1901) 77,790. R. A. R.

York: town and port of entry; York co., Me.; on York river and Cape Neddick harbors, and the Boston and Maine Railroad; 9 miles N. E. of Portsmouth, N. H., 45 miles S. by W. of Portland, and 99 miles S. W. of Augusta (for location, see map of Maine, ref. 12–B). It is in an agricultural region, is a summer resort of considerable note, and has a public high school, 15 schools, 9 churches, a national bank with capital of $60,000, and a weekly newspaper. It contains the villages of York, York Corner, York Beach, and Cape Neddick, and in 1894 had an assessed valuation of $1,622,132. The town was formed from a portion of the territory granted by the Plymouth Council to Sir Ferdinando Gorges and John Mason in 1622. On Mar. 1, 1640, Gorges incorporated the territory of 21 sq. miles and its inhabitants into a body politic, which he named Gorgeana. This was the first grant of incorporation for a city in America. In 1649, on the death of Charles I., the inhabitants of Gorgeana city, Kitterytown, Wells, and the Isles of Shoals formed themselves into a confederacy, and in 1652 Massachusetts assumed control of the colony, revoked the city charter of Gorgeana, changed the name of the place to York, and incorporated it as a town, with limits about as at present. Pop. (1880) 2,463; (1890) 2,444; (1900) 2,668.

EDITOR OF "COURANT."

York: city; capital of York co., Neb.; on the Burlington Route, the Fre., Elk. and Mo. Val., and the St. Jos. and Gr. Ind. railways; 50 miles W. of Lincoln, the State capital (for location, see map of Nebraska, ref. 10–G). It is in an agricultural region; contains York College (United Brethren), the school of the Holy Family (Roman Catholic, conducted by the Ursuline Sisters), high school, several lower public schools, and 3 national banks with combined capital of $150,000; and has a monthly, a daily, and 4 weekly periodicals. Pop. (1880) 1,529; (1890) 3,405; (1900) 5,132.

EDITOR OF "TIMES."

York: city; capital of York co., Pa.; on the Codorus creek, and the North. Cent., the Penn., the York South., and the Balt. and Harris. (E. extension) railways; 28 miles S. E. of Harrisburg, 96 miles W. of Philadelphia (for location, see map of Pennsylvania, ref. 6–G). It is laid out in quadrangles designed to be 480 feet wide by 520 feet long, and has a slightly undulating surface and excellent drainage. There are three public parks, Penn (containing 13 acres), Highland, and Farquhar. Local and suburban travel is accommodated by electric railway. The public buildings include the court-house, county prison, almshouse, city hospital, alms hospital, U. S. Government building, Children's Home, four market-buildings, an opera-house, a Masonic Temple, and several public halls. The city has an abundant water-supply, gas and electric-lighting plants, and a thoroughly equipped fire department.

There are 48 churches, viz.: Lutheran, 9; Reformed, 5; Methodist Episcopal, 5; Presbyterian, 4; Baptist, 3; Evangelical, 4; Roman Catholic, 2; United Brethren, 5; Quaker, 1; Protestant Episcopal, 2 (begun in 1769); Moravian, 3; German Baptist, 1; Winebrennerian, 2; and Hebrew, 3. The public-school system comprises 22 school-houses (valued at $484,000), 130 teachers, and 5,000 pupils, and the annual cost is $85,310. The Collegiate Institute has an endowment of $150,000, and property valued at $100,000. York Academy was founded in 1787. There are 3 parochial schools, 2 Roman Catholic, and 1 Lutheran, with property aggregating $10,000 in value. A free circulating library is maintained by St. John's church.

Business Interests.—In 1900 the census showed that 464 manufacturing establishments reported. These had a combined capital of $9,674,684, and employed 7,687 persons, to whom $2,637,781 was paid in wages. Materials were used that cost $6,114,671, and the total output was valued at $11,955,836. The principal industries were the manufacture of agricultural implements, passenger and freight railway cars, turbine water-wheels, rolled metals, ice machines and refrigerators, safes, electric-power machinery, wagons and carriages, wall-paper, iron, flour, candy, chains, crackers, carpets, cigars, and wire-cloth. There are 6 national banks with combined capital of $1,450,000, a State bank with capital of $100,000, 2 trust companies with capital of $300,000, and 2 private banks.

History.—The borough was laid out in 1740; the first court of general quarter sessions was held in 1749; Congress sat here in 1777–78; the borough was created in 1787, and the city in 1887. Pop. (1880) 13,940; (1890) 20,793; (1895) estimated, 25,000; (1900) 33,654. C. J. WOOD. Revised by E. S. YOUNG.

York, CARDINAL: See STUART, HENRY BENEDICT MARIA CLEMENT.

York, DUKES OF: a title often conferred upon younger sons of the Kings of England, some of whom have come to the throne through the decease of their elder brothers. The first duke was Edmund Plantagenet, fourth son of Edward III., and from him were descended the princes who, after the many vicissitudes of the Wars of the Roses, became kings under the titles of Edward IV., V., and Richard III. The title was held by Henry VIII. and Charles I. during the lifetime of their elder brothers, and by James II. until his accession to the throne. It was bestowed by the old Pretender upon his second son, Henry Benedict, known as Cardinal York, the last of his family, and was held successively by George I.'s brother, Ernest Augustus (d. 1728), by Edward Augustus (1739–67), brother of George III., and by the latter's second son, Frederick Augustus (1763–1827), who figured in the wars against Napoleon, and in 1795 was made commander-in-chief of the British army, but showed little capacity as a general. The title was revived in 1892, when it was conferred upon Prince George, second son of the Prince of Wales and heir to the throne by the death of the Duke of Clarence, his elder brother, Jan. 14, 1892.

York and Lancaster, Wars of: See ROSES, WAR OF THE.

Yorke: See HARDWICKE, EARLS OF.

York River: the tidal estuary of Mattapony and Pamunkey rivers, which unite at West Point, Va., whence it extends eastward 40 miles to Chesapeake Bay. On York Spit, at its entrance, stands a lighthouse.

Yorkshire: See YORK.

Yorktown: capital of York co., Va. (for location of county, see map of Virginia, ref. 7–I); on York river, notable from the two sieges which it has sustained. Pop. (1900) 151. On Aug. 1, 1781, Lord Cornwallis posted himself here with a force of something more than 8,000 men, supported by several frigates and other vessels which were anchored in York river, fortifying his position by strong redoubts and batteries on the land-side, and by a line of batteries along the river; also strongly fortifying Gloucester Point on the opposite side of the stream. In the latter part of September the combined American and French forces under Washington and Lafayette, numbering about 16,000 men, invested Yorktown. On Oct. 9 the first parallel was established, and fire was opened, by which several of the British guns were dismounted, and on the following evening a frigate and three large transports were destroyed. On the 11th the second parallel was opened, and as the besiegers were annoyed by an enfilading fire from two redoubts, a successful attack was made upon them on the night of the 14th, and the captured works were included in the parallel. A large French fleet under Count de Grasse in the meanwhile prevented Cornwallis from receiving the re-enforcements which were sent to him by Sir Henry Clinton from New York. On the 16th he made an ineffectual sortie, and on the next day offered to capitulate. The terms having been agreed upon, on the 19th he surrendered his whole force, consisting of 7,247 regular troops, 840 sailors, with 235 guns. The entire British loss in killed, wounded, and missing was about 550; that of the Americans and French, about 300. This surrender virtually brought the war of the Revolution to a close.—The second siege of Yorktown was during the civil war. Gen. Magruder, with between 10,000 and 15,000 Confederates, had taken possession of the place early in the spring of 1862, and Gen. McClellan, advancing up the Peninsula with about 53,000 men reached Magruder's defensive line on Apr. 5, and thinking it too strong to be carried by assault, began his preparations for a siege. The Confederates were soon largely re-enforced by Gen. Johnston, who took the command, having in all about 53,000 men; the Union army was also largely re-enforced, reaching finally a strength of nearly 100,000 men. The besieging works were completed, and fire was to have been opened May 6, but two days previously Johnston secretly evacuated the works, carrying away everything worth taking, except the heavy guns. Revised by JAMES MERCUR.

Yorkville: town; capital of York co., S. C.; on the Chester and Lenoir, and the Ohio River and Charleston railways; 22½ miles N. of Chester, 84 miles N. of Columbia (for location, see map of South Carolina, ref. 4–D). It is in an agricultural and magnetic iron-mining region, and has 7 churches, 2 academies for males, public graded school, a State bank with capital of $30,000, water-works, buggy, spoke, handle, saddle and harness factories, and a semi-weekly, a weekly, and a monthly periodical. Pop. (1890) 1,553; (1900) 2,012. PROPRIETORS OF "ENQUIRER."

York von Wartenburg, -vaär'ten-boörch, HANS DAVID LUDWIG, Count: field-marshal; b. at Potsdam, Prussia, Sept. 26, 1759: entered the army in 1772; was cashiered in 1779 for insubordination; served in the Dutch army in India 1783–84; re-entered the Prussian service as a captain, and was made a major-general in 1807, and governor of the province of Prussia in 1811. During the Russian campaign of 1812 he commanded the Prussian auxiliary corps in Napoleon's army, and concluded (Dec. 30, 1812) a convention with the Russians, according to which his corps remained neutral during the retreat. The Prussian king was compelled to denounce this convention for some time, but when Prussia soon after declared war against Napoleon, York's conduct was highly praised. He fought with great distinction in the campaigns of 1813–14, was made a count and field-marshal, and died at Kleinöls, near Breslau, Oct. 4, 1830.

Yoruba, yō'rōō'baä', or **Yarriba**: a region comprising about 19,000 sq. miles mostly undulating plain, in Northwest Africa, W. of the Niger river, and N. of the Bay of Benin. It was a powerful native kingdom until about 1825, and extended almost to the Bay of Benin, while to the E. and N. E. it reached the Niger. Much of the territory was lost in wars with the Fulbe of Gandu, and the complete disintegration of the kingdom resulted in splitting the country into independent districts, each under its own chief, and these political divisions still exist. Yoruba is one of the most densely peopled parts of Africa. The population is estimated at 3,000,000, and there are a number of towns, of which Ibadan and Ojo are the most important, each containing from 50,000 to 80,000 inhabitants. The people are mostly of pure Negro blood, speaking a variety of dialects of their common language, most of them professing the Mohammedan faith, though in the southern part of the country Christianity has gained a firm foothold through the efforts of fifteen missionary stations. In no part of barbarous Africa is agriculture more highly developed, and in the early morning the roads leading to the towns are thronged with farmers carrying all kinds of farm-produce to market. Cloth-making and leather, iron, and other manufactures are far advanced, and in most respects Yoruba is completely self-sustaining and one of the most prosperous parts of Africa. The chief export is palm oil, and this trade has brought the natives into relations with the British at Lagos, who write of Yoruba as an appendage of their colony, though the influence of Great Britain has not yet (1895) been officially extended over the country. C. C. ADAMS.

Yosemite (yō-sem'i-te) **Valley**: a region of remarkable scenic attraction, situated in the Sierra Nevada of California, about 150 miles in a direct line a little S. of E. of San Francisco. It was discovered in 1851, having been first visited by a party of settlers in the vicinity of the mining-camp of Mariposa while in pursuit of a band of Indians who had made themselves troublesome to the whites, and who were ascertained to have a stronghold in the mountains. The word *Yosemite* means "a full-grown grizzly bear," and was not the aboriginal name of the valley itself, but that of a noted chief.

The Yosemite valley is about midway between the east and west bases of the Sierra, which is here not far from 70 miles in width. It is a level area, about 6 miles in length, and from half a mile to a mile in width, and is sunk nearly a mile in depth below the general level of the adjacent region. It has very much the character of a gorge or trough hollowed in the mountains in a direction nearly at right angles to their general trend. The river Merced, which heads in the Sierra some 15 miles higher up than the head of the valley, runs through the Yosemite with many graceful windings. Two branches of the main Merced also enter the valley near its head: one, the Tenaya Fork, which rises in a beautiful mountain-lake of the same name, comes in from the N. E.; the other, the Illilouette, enters from the S.

In entering the Yosemite by the roads which approach it from the lower ends, the visitor notices that he has before him a valley of a different type of form from those he has before been accustomed to see. He passes from a V-shaped gorge or cañon, into one which may be fairly called U-shaped, since its walls rise almost vertically from its floor. This change of form is strikingly impressed on the visitor as he approaches what may be called the gateway of the Yosemite. Here he sees before him, on the north side of the valley, the mass of rock called El Capitan, and, exactly opposite, the Bridal Veil and Cathedral Rocks. At this point the distance across the valley is only a mile, measured from the summit of the Bridal Veil Rock to that of El Capitan, and at the base of these cliffs there is only just room for the river to pass. El Capitan is an immense block of granite projecting squarely out into the valley, and presenting two almost vertical faces which meet in a sharp edge 3,300 feet in perpendicular elevation. The sides or walls of this mass are smooth, and entirely destitute of vegetation. The most striking face of the larger Cathedral Rock is turned up the valley, but on the side facing the entrance there is a feature of great beauty—namely, the Bridal Veil Falls, made by the creek of the same name, which, as it enters the valley, descends in a vertical sheet of 630 feet perpendicular, striking there a pile of *débris*, down which it rushes in a series of cascades, with a vertical descent of nearly 300 feet more, the total height of the fall being 900 feet. When the stream is neither too full nor too low, the mass of water in its fall vibrates with the varying pressure of the wind, blowing in the daytime up the valley, fluttering and waving in a manner to justify the poetic name it now bears. There is also a charming fall, the Virgin's Tears, in a recess of the rocks opposite the Bridal Veil, and just below El Capitan. This is over 1,000 feet high. It runs, however, but a short time during the early summer months.

Passing up the valley after entering between the Cathedral Rocks and El Capitan, the level area or river bottom increases to nearly half a mile in width. This area is broken

up into small meadows, gay with flowers in the early summer, and sandier regions on which grow numerous pitch-pines (*P. ponderosa*) and some oaks, cedar, and firs. The walls of the valley continue lofty and broken into the most picturesque forms. Of these the Three Brothers and the Sentinel Rock are the most conspicuous. Nearly opposite the Sentinel Rock is one of the most attractive features of the Yosemite—namely, the fall made by Yosemite creek down the wall on the north side of the valley. There is first a vertical fall of 1,500 feet, then a descent of 626 feet in a series of cascades, and finally one plunge of 400 feet on to a low talus of rocks at the foot of the precipice.

At the head of the valley are the falls of the Merced river. There are two of them, with beautiful intervening rapids. The lower one is called the Vernal Fall, and is about 400 feet in vertical height. The upper, the Nevada Fall, is about 600 feet in elevation.

The dome-shaped masses of granite which characterize the vicinity of the Yosemite are also extremely grand. The North Dome, on the north side of the valley, lends itself to beautiful combinations of scenery, as seen from various points a little above the Yosemite Falls. The Sentinel Dome, on the opposite side, is not visible from the valley itself, but it affords a magnificent view from its summit of the valley and its surroundings, and especially of the High Sierras. A projecting cliff, called Glacier Point, a little lower than this, and just on the edge of the valley, is also much visited for the sake of the view which it offers of the whole region. The rock thus named is the highest point in the immediate vicinity of the Yosemite, rising to an elevation of 4,737 feet above the general level of the valley. The Half Dome fronts the valley of the Tenaya Fork of the Merced with a very steep slope, crowned by a vertical wall of fully 1,600 feet in elevation, forming a mass of imposing magnitude.

The Yosemite valley was given by Congress to the State of California in 1864, to be "held for public use, resort, and recreation," and to be "inalienable for all time." It is managed by commissioners appointed by the Governor. Wagon-roads have been made into the valley from its lower end and leading up the Merced river. These, however, have been built and are owned by private parties, and the same is true of the various excellent trails which have been built to afford access to Glacier Point, Union Point, and other elevations commanding remarkable views. The San Joaquin Valley and Yosemite Railroad, 22 miles long, extending from Berenda station, on the Central Pacific Railroad, to Raymond, where it connects with stage-line to Yosemite valley, was opened in 1886. Revised by I. C. Russell.

Youatt, William: b. in England in 1777; was for many years professor in the Royal Veterinarian College, and proprietor and coeditor of *The Veterinarian*, established in 1828. He was the author of *The Horse* (1831), a standard work, of which two American editions have been published; *Sheep, their Breeds, Management, and Diseases* (1832); *Cattle, etc.* (1834); *The Dog* (1842); *The Pig* (1860); and *The Complete Grazier* (1864). D. in London, Jan. 9, 1847. Prof. Youatt's works are highly esteemed by stock-raisers in Great Britain and the U. S.

Youghal, yaw'āl: town; county of Cork, Ireland; on the estuary of the Blackwater, 27 miles by rail E. of Cork (see map of Ireland, ref. 13–E). It has a good harbor, admitting vessels of 400 to 500 tons, and a large export trade in agricultural produce. Here, according to local tradition, the first potatoes were planted by Sir Walter Raleigh, whose house is still preserved. Pop. (1891) 4,317.

Youmans, Edward Livingston, M. D.: scientist; b. at Coeymans, N. Y., June 3, 1821; studied chemistry, physics, and medicine, although, on account of a disease of the eyes which made him blind at times for many years, he could pursue his studies only by the aid of his sister, Eliza Anne Youmans, known by her educational publications. Besides delivering scientific lectures before popular audiences during a period of fifteen years, he published *A Chemical Chart* (1850); *Class-book of Chemistry* (1852); *Alcohol and the Constitution of Man* (1854); *Chemical Atlas* (1856); *Handbook of Household Science* (1857); *Correlation and Conservation of Forces* (1864): *The Culture demanded by Modern Life* (1867). In 1871 he founded the International Scientific Series (New York, London, Paris, Leipzig, St. Petersburg, and Milan), of which seventy-two volumes have appeared, and in 1872 he founded the *Popular Science Monthly*. D. in New York city, Jan. 18, 1887.
Revised by W. J. Youmans.

Youmans, William Jay, M. D.: editor; brother of Edward L. Youmans; b. at Milton, Saratoga co., N. Y., Oct. 14, 1838; studied chemistry in his brother's laboratory at Saratoga, N. Y.; spent one year under Prof. Joy in the laboratory of Columbia College, New York; took a special course of one year in the Sheffield Scientific School, New Haven, Conn.; took a full course in medicine at the University of the City of New York, graduating 1865; pursued the study of anatomy and physiology under Prof. Huxley in the Jermyn Street School of Mines, London; practiced medicine for three years in Minnesota; assistant editor *Popular Science Monthly* 1872–87, editor till 1900; prepared the articles on chemistry, metallurgy, and physiology for Appletons' *Annual Cyclopædia*; edited Huxley's *Lessons in Elementary Physiology*, to which he added a second part on *Elementary Hygiene* (New York, 1867); revised and rewrote his brother's *Class-book of Chemistry* (New York, rev. ed. 1889); published *Pioneers of Science in America* (New York, 1895). D. April 10, 1901.

Young, Arthur: writer on agriculture; b. at Whitehall, London, England, Sept. 11, 1741; was in early life engaged in mercantile business at Lynn, which he abandoned for the pursuit of scientific agriculture; spent most of his life at Bradfield Hall, Suffolk; managed a large farm at Stamford Hall, Essex, 1765–70; traveled through most of the counties of England and Ireland in quest of information on the current methods of farming; made a careful tour through France for a similar purpose; wrote for the *Museum Rusticum* and for William Nicholson's *Journal of Natural Philosophy* (1792, *seq.*); edited the *Universal Museum*; was for some time parliamentary reporter for the *Morning Post* (1765, *seq.*); was engaged in practical husbandry from 1779; conducted through forty-five volumes the *Annals of Agriculture*, established by him in 1784 at Bury St. Edmund's, and issued at London after 1808, a publication to which George III. sometimes contributed under the name of Ralph Robinson; corresponded with Washington on agriculture, and was secretary to the board of agriculture from 1793 to his death, at London, Apr. 20, 1820. Among his many works may be specified the *Farmer's Letters to the People of England* (1768); *A Six Weeks' Tour through the Southern Counties of England and Wales* (1768); *A Six Months' Tour through the North of England* (4 vols., 1770); *The Farmers' Guide* (2 vols., 1770); *Rural Economy* (1770); *A Course of Experimental Agriculture* (2 vols., 1770); *The Farmer's Tour through the East of England* (4 vols., 1771); *The Farmer's Kalendar* (1771; 215th ed. revised by J. C. Morton, 1862); *Political Arithmetic* (2 parts, 1774–79: translated into several foreign languages); *A Tour in Ireland* (2 vols., 1780); *Travels, etc., with a View of Ascertaining the Cultivation, Wealth, Resources, and National Prosperity of the Kingdom of France* (Bury St. Edmund's, 2 vols., 1792–94; in French, Paris, 3 vols., 1794); *The Example of France a Warning to Great Britain* (1793); *An Essay on Manures* (1804); *The Progressive Value of Money as marked by the Price of Agricultural Products* (1812); and *The Rise of Prices in Europe, etc.* (1815). By order of the French Directory a collective edition of his agricultural works was published in French under the title *Le Cultivateur Anglais*, etc. (20 vols., 1800–01). Arthur Young was perhaps the most eminent of writers on agriculture, and his fame may be expected to increase for centuries to come. An edition of the *Travels in France* with *Life*, by Matilda Betham-Edwards, appeared in 1890, and an edition of the *Tour in Ireland*, by A. W. Hutton, with bibliography by J. P. Anderson, in 1892. Revised by L. H. Bailey.

Young, Brigham: Mormon; b. at Whitingham, Vt., June 1, 1801; the son of a farmer; was educated in the Baptist Church, and trained as a painter and glazier, but joined in 1832 the Mormons at Kirtland, O., and started in 1835 on his first missionary journey. He was very successful as a preacher, and made many converts, being possessed of a peculiar but very impressive eloquence, and at the same time rose to the highest dignities and acquired an almost boundless influence within the sect by his energy and shrewdness, and by the power of his personality. After the death of Joseph Smith in 1844, he was chosen president of the church by the apostles, and in 1846 he led the host of the Mormons from Nauvoo across the prairies to Great Salt Lake valley, where he founded Salt Lake City in 1847. In Mar., 1849, a convention was held in that city, a constitution was framed, and a State was organized under the name of *Deseret*, which in the "reformed Egyptian" language is

said to mean the "Land of the Honey-bee." Congress refused to admit the new State, and organized the Territory of Utah, Brigham Young being appointed Governor. Conflicts soon arose with the Federal Government (see UTAH), but the U. S. officers were expelled from the Territory, and Brigham Young declared his intention to continue as Governor. In spite of the forcible measures which the Government took from time to time, he continued to wield an almost unlimited power as president of the church. On Aug. 29, 1852, he introduced polygamy as an institution, as the celestial law of marriage, and he carried it through in spite of considerable resistance from a division of the church itself. In 1871 he was indicted for polygamy, but was not convicted. D. at Salt Lake City, Aug. 29, 1877.

Young, CHARLES AUGUSTUS, Ph. D., LL. D.: astronomer; b. at Hanover, N. H., Dec. 15, 1834; graduated at Dartmouth College 1853; was assistant teacher in Phillips Academy, Andover, Mass., 1854–55; studied theology in Andover Seminary 1855–56; was Professor of Mathematics and Natural Philosophy in Western Reserve College, Ohio, 1856–66; was called in the latter year to the professorship of Natural Philosophy and Astronomy at Dartmouth, a chair which had been filled by both his father and his grandfather, Prof. Ebenezer Adams; and in 1877 to the chair of Astronomy at the College of New Jersey, at Princeton. Prof. Young was the discoverer, associated with Harkness, of the spectrum of the corona in 1869, in 1870 of the reversal of the solar spectrum by the lower strata of the sun's atmosphere, and in 1872 of the presence of sulphur, cerium, and strontium in the sun by observations upon the spectrum of the chromosphere, made at Sherman, Wy., at an elevation of 8,000 feet. He was chosen an associate fellow of the American Academy of Arts and Sciences at Boston in 1871, a member of the National Academy of Sciences in 1872, and in that year was also elected a foreign associate of the Royal Astronomical Society of Great Britain. Prof. Young is the author of numerous published papers on science, of *The Sun* in the International Scientific Series (New York, 1882), and of *A Text-book of General Astronomy* (Boston, 1888).

Revised by SIMON NEWCOMB.

Young, EDWARD: poet; b. at Upham, Hampshire, England, in 1684; educated at Winchester School and at Corpus Christi College, Oxford; obtained a law fellowship at All Souls College, Oxford; took there the degree of doctor of laws 1719; took orders in the Church of England 1727; was appointed a royal chaplain 1728; became rector of Welwyn, Hertfordshire, 1730; married a daughter of the Earl of Litchfield 1731; and was appointed clerk of the closet to the princess-dowager of Wales 1761. D. at. Welwyn, Apr. 12, 1765. He published, among other things, a number of tragedies—*Busiris* (1719), *The Revenge* (1721), etc.; a collection of satires, *The Love of Fame* (1725–28), and many other poems and miscellaneous writings; but is best remembered by his gloomy and didactic religious blank-verse poem *Night Thoughts* (1742–46), once very popular and still extensively quoted. His works were published in 1762.

Young, Sir GEORGE: See the Appendix.

Young, JAMES, LL. D., F. R. S.: b. at Glasgow, Scotland, July 14, 1811; was in early life a joiner; attended the chemical lectures of Prof. Thomas Graham at the Andersonian Institution; was his assistant, first in Glasgow and afterward at University College, London, 1832–38; was employed in a scientific capacity in Muspratt's chemical works at Newton 1838–42, and in Tennant's works at Manchester 1842–46; analyzed about 1847 the petroleum found in a spring in a coal mine in Derbyshire; obtained from it a lubricating oil for machinery and a lighter oil for burning in lamps; was led thereby to undertake the slow distillation of coal by a process for which he took out a patent, thus created a new and important industry, permanently cheapening the price of light; established coal-oil works at Bathgate, and subsequently at Addiewell, Scotland; acquired a large fortune, and contributed indirectly to the rise of the vast petroleum industry in the U. S.; gave £10,000 for the endowment of the chair of Chemistry in the Andersonian Institution, Glasgow; erected a bronze statue to Prof. Graham at Glasgow, and sent out at his own expense in 1872 an expedition to Central Africa in search of his intimate friend, Dr. Livingstone. D. May 13, 1883.

Young, JOHN RUSSELL: journalist; b. at Downingtown, Pa., 1841; educated at high school, New Orleans; was compositor, reporter, and news-editor and, 1861–64, war correspondent on the Philadelphia *Press*. Attracting the attention of Horace Greeley, he was employed on *The New York Tribune*, and became managing editor. He started the New York *Standard* in 1869, joined the *Herald* staff in 1872, and traveled as *Herald* correspondent with Gen. Grant around the world, about which journey he wrote a book. He was U. S. envoy extraordinary and minister plenipotentiary to China in 1882–85. He was made Librarian of Congress in 1897. D. in Washington, D. C., Jan. 17, 1899.

Young, ROBERT: See the Appendix.

Young Men's Christian Associations: societies of young men, with a basis of specific Christian principles, working by methods consistent with the same for the physical, social, mental, and spiritual improvement (*a*) of their membership and (*b*) of young men in general.

Various societies of young men more or less akin to these associations have existed at different times since early in the seventeenth century. Some in England and also in the U. S. acquired a degree of importance, but they were generally short-lived. In a few instances organizations claiming an existence prior to or independent of the London movement subsequently became affiliated with it. This was true of the German *Christliche Jünglingsvereine*.

In 1841 George Williams, a devout and active young Christian, then in his twenty-fourth year, removed from a provincial town to the English metropolis and became a clerk in a large dry-goods house. He soon began a quiet but earnest effort among his companions, nearly all of whom were irreligious, and many very profligate. Numbers were led into the Christian life, the good influence spread to other houses, and June 6, 1844, an organization was effected under the name of Young Men's Christian Association. To the meetings for prayer and Bible study were soon added the library and reading-room and courses of lectures; a secretary was employed, and branches were formed both in the metropolitan districts and in other cities of Great Britain. Christian travelers brought into contact with the London association scattered the seed in other countries; especially was this done in connection with the Industrial Exposition of 1851, soon after which these societies began to spring up not only in Europe, but also in America and Australia. The total number of associations in the world is now 5,289, distributed as indicated in the following.

GREAT BRITAIN AND IRELAND.—Twenty years after the founding of the London society the associations in the United Kingdom numbered 160. The first conference of British associations was held in 1858; the first association building was erected in 1866; the first district union was formed in 1867; the first traveling secretary was appointed in 1868. A national union for England and Wales was formed in 1882. Scotland and Ireland have also each a general organization, the first formed in 1874, the latter in 1884. Twenty-four representatives from these three autonomous executives, twelve from the first named and six from each of the other two, constitute the British committee, which supervises all general matters in the United Kingdom and represents the associations in their foreign relations. A British conference is held annually. Each national union is subdivided into district unions. More rapid progress has been made since the general organization was effected, as is indicated by the following comparative figures:

ENGLAND, IRELAND, AND WALES.	1883.	1893.
Number of associations	188	405
Active membership	17,618	33,563
Associations owning buildings	19	80
Valuation of buildings	£153,637	£397,695
Annual current expenses	£31,013	£72,565
Reading-rooms and libraries	227	552
Gymnasiums	9	91
General secretaries	45	63
Weekly religious meetings	493	848

Scotland has 246 associations, with a membership of 25,500. Twenty-five associations own the premises they occupy. A traveling secretary was placed in the field in 1880.

THE CONTINENT OF EUROPE.—Between the years 1806 and 1841 a number of *Christliche Jünglingsvereine* came into existence in Germany. They were little more than bands of young men united for prayer, Bible study, and mutual encouragement in the Christian life, and usually if not always in connection with an individual church. Later, under the influence of the London movement, and especially after the first world's conference (Paris, 1855), new organizations sprang up in the various countries, and all accepting the

Paris "basis" became affiliated through the *Conférence Universelle*. A large number of the European societies are still very limited as to both methods and appliances, resembling the earlier *Jünglingsverein*. In the chief centers, however, such as Paris, Berlin, Geneva, Stockholm, etc., a broad and progressive work has been established, and this is gradually influencing the work throughout the Continent.

Germany.—Previous to 1841 the *Christliche Jünglingsvereine* had been organized in perhaps a score of German towns. The number increased, and in 1848 the first district union (*Westdeutscher Bund*) was formed with Elberfeld as its center. The eighth of these unions was formed in 1890. In 1883 a new and broader form of organization (*Christliche Vereine Junger Männer*), resembling the American associations, was started in Berlin. This has since spread to other cities, and its methods have been adopted by many of the older societies. The German associations were united in a national alliance in 1882. There are 1,180 organizations with a membership of 64,362; forty own buildings.

Switzerland.—The Swiss associations form two independent unions, the German and the French. Each union is divided into cantonal organizations, and these into districts, and again into groups. The national gathering of the German union is biennial, that of the French triennial. Excepting a few of the *Christliche Jünglingsvereine*, the Swiss associations do not date earlier than 1850, and increased but slowly for the first decade. The two unions aggregate 399 associations with 7,200 members; there are seven buildings and ten employed secretaries.

France.—At the close of 1852 perhaps a dozen associations existed in the south of France. The first world's conference, meeting in Paris in 1855, gave a new impetus to the French societies, and they increased in number and strength. The present national alliance was formed in 1867. In 1893 the Paris association entered its new building, adapted to the advanced methods of work. Several other cities are also aggressive centers. The French associations number 128, divided into seven groups. A national traveling secretary was placed in the field in 1893.

Holland.—An association was formed in Amsterdam in 1851. Two years later the seven societies then in existence were federated in the *Nederlandsche Jongelings-Verbond*. In 1861 a traveling agent was appointed. Besides the 195 associations with a membership of 5,500 in this federation, there are three independent or denominational alliances, which aggregate 550 societies and 12,000 members.

Belgium.—The first association was formed in Brussels in 1853. The first general conference met in 1859, when the eight societies represented formed a Belgian alliance. The Belgian associations number 35, with 851 members.

Sweden.—An attempt was made to establish associations in Sweden in 1852, and again in 1876, the latter effort being for a time successful; but the existing movement began with the organization of the Stockholm association, in 1884, after the model of those at Paris and Berlin. At a conference held in 1888 a Swedish alliance was formed, and a national committee constituted. There were at this time twenty associations and 600 members. Later in the same year the meeting of the world's conference in Stockholm greatly promoted the Swedish work. The number of associations has increased to 52, with a membership of 4,560.

Norway and Denmark.—A Norwegian student brought in contact with the associations in Germany on returning formed an organization in Stavanger in 1868, and the year following, another in Christiania. In 1880 representatives from twelve societies met and formed a national alliance. Since 1889 a traveling secretary has been employed. The national conference meets triennially. There are also annual district meetings. The associations number 185, with 11,000 members. They own twelve buildings valued at 450,000 francs, and employ three secretaries. In 1890 the associations of Norway and Denmark united in a Dano-Norwegian alliance. The Danish associations, which date from 1878, number 135, and have a membership of 4,000.

Italy.—Between 1850 and 1853 a number of associations were organized in the Vaudois valleys, and in the latter year they met and formed a general organization. An association in Venice has recently celebrated its twenty-fifth anniversary. Most of the present organizations, however, date from 1880 and later. In 1887 representatives from thirty associations met in Florence and formed a national alliance. The 5 groups aggregate 50 organizations, with 1,500 members.

Other European States.—At Budapest, in *Hungary*, an association was formed in 1850. Six have since been added, the total membership being 270. St. Petersburg, *Russia*, has maintained an association since 1868. The whole number of organizations, including the Finland group, is 17 with 1,070 members. *Spain* has 7 small associations, the first organized in 1871. The first association in *Austria* was formed at Vienna in 1873. A second has been organized in the same city, and there are 9 in Bohemia, 4 in Moravia, 1 in Styria, with a total membership of 430. There is a single association in *Turkey*, at Constantinople, 1 at Samokov, in Bulgaria, 1 in the island of Malta, and 1 at Gibraltar.

ASIA.—The association not being a pioneer agency, and only following the Church, is confined to Christian countries and mission lands. In the latter it is brought in only as desired by the missionaries and as auxiliary to their work. There are some forty associations scattered among the mission stations of Syria, Persia, and Asia Minor. Eight or ten organizations are also connected with the various missions in China.

India.—Associations were first formed in Trivandrum (1870) and Bombay (1875). Model associations have been organized at several centers, a national committee has been formed, and annual conferences are held. There are 78 associations and nearly 4,000 members, largely Indian young men. In the island of *Ceylon* there are 17 associations, the first having been formed in Colombo in 1882.

Japan.—An association was started in Tokio in 1880, and others soon followed. The work was greatly promoted by the visit in 1884 of an agent of the world's committee, and the subsequent residence in Tokio of a secretary of the American committee. Since 1889 a summer school has been held, with an average attendance of 500. A national union was formed in 1893. The Tokio association has a fine building that cost $50,000. The general secretary and the entire directory are Japanese laymen. There are 35 associations affiliated with the Tokio movement, including fifteen in Government schools.

AFRICA.—An association has been in active existence at Cape Town since 1855. There are some 20 organizations in South Africa, five own buildings, one has a paid secretary. There are also 3 associations in Egypt, 2 in Madagascar, and 1 each in Algeria, Morocco, and Guinea.

OCEANICA.—Associations were formed at Sydney, in Australia, and Auckland, New Zealand, in 1855. The associations in this group number 23, with 4,500 members. Four own buildings and employ secretaries. An intercolonial organization and an annual conference are maintained. At Honolulu, Hawaii, an association was formed among the foreign young men in 1869. It has a good building and a paid secretary. A number of organizations exist among the natives and one each among the Chinese and the Japanese. There is also an association among the lepers on Molokai, for which a building has recently been erected.

AMERICA.—Although young men's religious societies existed in North America more than 200 years ago, the Young Men's Christian Associations are a direct outgrowth from the London movement of 1844. With the exception of less than a score of societies in South America and the West Indies, the associations of the continent—embracing those of the U. S., Canada, and Mexico—form one affiliated body under supervision of the American international committee. The English-speaking peoples have always led in the work of these societies, and nowhere has there been such rapid development and breadth of scope as in North America.

The first American associations were organized in Dec., 1851, at Montreal and Boston; some 24 were added during the next two years, and by the end of the decade the number had reached 200. The first convention met in Buffalo, N. Y., June 7, 1854, 19 of the then 39 associations sending delegates. Its action resulted in a confederation, with a central committee and an annual convention, this form of affiliation continuing until the civil war. The war greatly depleted the membership, and such organizations as survived were chiefly employed in aiding their fellows in the army. At a special convention of the associations in the Northern States, held in New York, Nov., 1861, the U. S. Christian Commission was formed—an organization which, receiving the support of the general public, sent 5,000 Christian helpers to the camps and hospitals, and distributed over $5,000,000 in money and stores. With the close of the war the reorganized work grew rapidly; errors and crudities disappeared with riper experience, and advanced ideas and better methods prevailed. The prejudices inci-

dent to a new movement also died out, and the associations were acknowledged to be "the Church at work interdenominationally, and, through its laymen, by and for young men." The evangelical test of active membership, a definite and all-round work, the ownership of carefully planned buildings, the employment of trained officers, systematic effort for special classes of men, a strong central committee for general supervision, with similar supervisory organization for individual States and Provinces, and great emphasis on the Bible and personal work were among the features adopted, developed, specialized, each contributing to the marvelous growth and efficiency of the following decades.

The General Work.—The American international convention is held biennially, every association being entitled to representation on the basis of its active membership. A central board, incorporated as the "international committee," is elected by the convention, one-third every two years, its headquarters and a working quorum being located in New York. The committee's executive force includes a general secretary, with twenty-five field, department, and office secretaries. It has also eight secretaries in foreign mission lands.

State and provincial organizations supplement in their several fields the work of the international committee. Called into existence by the Albany convention of 1866, there are now 36, embracing 50 States and Provinces; their executive committees number 750 members, with 60 traveling and office secretaries. Thirty conventions are held annually, attended by from 5,000 to 7,000 delegates. A well-organized State is divided into a number of districts, each with its committee, an annual conference, and corresponding members in non-association sections. The annual expenditures of the international and State committees aggregate $200,000.

The Local Work.—The local association has absolute autonomy, except that to affiliate with the American international convention there must be constitutional provision restricting active (voting and office-bearing) membership to men in communion with an evangelical church. A typical American association may be thus described: (1) Membership—(*a*) *active*, Christian young men who constitute the working force; (*b*) *associate*, young men of good moral character. There are 1,430 associations and 250,000 members, over one-half being associates. Thousands of non-members in every city also come in contact with the helpful agencies of the organization. (2) An incorporated board of management, officers, and system of committees. The members of these boards and committees number 37,000. (3) A paid secretary, as executive officer, and fitted for the position by Christian and business character, tact, and technical training. His chief province is to supervise and develop. Often one or more assistants are required. There are 1,200 of these officers in local fields. An international and many State conferences are held by them annually for the discussion of methods. Two well-equipped training-schools are also in operation, at Springfield, Mass., and at Chicago, Ill. (4) A specially constructed building, with focal reception-room, reading-room, library, parlor, recreation-room, offices, educational class-rooms, gymnasium, including bowling-alley, baths, and dressing-rooms, rooms for boys' department, kitchen, and janitor's quarters. There are 305 buildings, many of them elegant and complete in their appointments, the total value of real estate being over $17,000,000. (5) Organized departments: (*a*) Business, general supervision, membership; (*b*) Religious—Bible and workers' training-classes, evangelistic and devotional meetings, work in behalf of personal purity, temperance, etc., systematic invitation work, distribution of religious literature, and a specially emphasized personal work. There is also a worldwide observance of an annual week of prayer in November. (*c*) Educational—library and reading-rooms, evening classes in commercial, industrial, scientific, literary, political and social-economic subjects, literary societies, and lectures. (*d*) Physical—gymnasium, athletic games, cycling, boating, swimming, etc., with instructors qualified to make physical examinations and prescribe and direct safe and beneficial exercise. Athletics are conducted in connection with an international athletic league. Emphasis is given to an all-round work, and on a scientific basis, as against specialties, and the associations lead all other organizations in the line of physical culture. (*e*) Social—a pleasant resort with companionable supervision, music, recreative games, social gatherings and entertainments, combining the attractions and the restraining influences of a Christian home. (*f*) Information and relief—employment bureau, boarding-house register, savings fund, medical club, visitation of the sick. (*g*) A work more or less complete along all these lines for boys.

The following are statistics of the associations in North America, and relate exclusively to work for young men: Religious—610 associations report 27,710 Bible class sessions, with a total attendance of 282,176; 448 report 13,910 Bible training-class sessions, with a total attendance of 119,950; 1,093 report 67,612 religious meetings, with a total attendance of 2,913,770. Secular—639 associations report an average daily attendance at rooms of 71,965; 840 report reading-rooms; 676 report libraries, containing 500,000 volumes, and valued at $422,536; 349 report educational classes, with 22,800 different students and 955 teachers; 230 report literary societies, with a total average attendance of 5,200; 568 report 5,062 lectures, etc.; 897 report 4,292 social entertainments; 493 report gymnasiums, 316 other means of physical culture. For current expenses 1,030 associations expend $2,250,240. Careful management and the amount of volunteer labor afforded yield large returns for the financial investment.

Work among Special Classes.—At first a work among merchants' clerks, with only moral and religious aims and few attractive appliances, the organization has so grown and widened in scope that, with its present equipment and versatile and flexible methods, it is able to touch young men of every class and on all sides of their nature. This is shown in the physical department with its broadly adaptive recreative, hygienic, and educative features, and in the evening classes, aggregating seventy-five lines of study, including the rapidly developing industrial work which is interesting large numbers of young mechanics. It is still more forcibly illustrated in the evolution of such strikingly dissimilar departments as the college and the railway work.

Work among College Students.—The present movement began in 1877, at which date there were a few college associations, but little activity or uniformity in methods, and no intercollegiate relations. Under the new international supervision the organizations have increased to more than 500, including the leading state and denominational schools, and, with a membership of over 33,000, form the largest college fraternity in the world. The associations are strongly knit together by a system of correspondence, visitation, and conferences, and are working with a definite and thoroughly outlined plan. Many convenient buildings are being erected for their use, and the larger societies employ a general secretary. Several men also give their time to this department in connection with the international and State committees. Summer schools are held for the study of the Bible, missions, and association methods, and through series of presidential and deputation conferences men are trained for leadership and visitation work. The student class in large cities is affiliated through an intercollegiate organization connected with the city association.

Among important outgrowths of this work are: (1) The summer schools, or Bible conferences, beginning in 1885, and spreading from Northfield over many lands. (2) The student volunteer movement, through which many have pledged themselves to foreign mission work, and more than 700 are already on the field. (3) The foreign work of the American committee, placing experienced secretaries at strategic centers to establish model associations and train native Christians for association work. Eight men have been sent out for this purpose to Japan, India, China, and South America. (4) The spread of affiliated Christian work to the colleges of other lands; the attendance of students from foreign universities at Northfield, and several tours of visitation abroad by college secretaries of the American committee have contributed to the establishment of the intercollegiate movement in Great Britain and to more or less progress toward organization in Germany, Switzerland, France, Scandinavia, India, Japan, and South Africa. The introduction of the English Bible as a department of study in colleges, the drawing of more students into distinctively religious callings, an impetus to Bible study, and a greatly increased religious activity among college students are among the direct local results.

Work for Railway Men.—Originating in 1872 and passing slowly through the experimental period, this work has developed into over 100 organizations at railway centers, with nearly 25,000 members, 126 employed officers, 3,000 men on working committees, and an annual current expenditure of $215,000. Nearly 40 buildings are either owned by them or set apart for their use. The corporations

contribute generously both to building funds and current expenses, and in every way promote and encourage the work. Ordinary methods, which are all well represented, are supplemented by certain distinctive agencies—rest-room and baths (day and night), lunch-counter, instruction in "first aid," emergency hospital, visits to sick and injured, and railway library. Membership tickets are reciprocal. Three international secretaries give their entire time to the supervision and extension of the department.

Associations of German-speaking young men have been formed in several cities having a large German population. There are in all 12 such associations and 8 well-equipped buildings. An agent for work among colored young men was placed in the field in 1879, since which 49 associations have been established, 29 being in colleges. The total membership is 2,800. The first association among the American Indians was organized by the Dakotas in 1877. The number has increased to 40, 4 of which are in Indian schools. An educated Sioux is the international secretary of the department. Work is also carried on among lumbermen, sailors, and soldiers, etc.; also among destitute young men in the large cities and the male inmates of hospitals, prisons, and reformatories. The associations are alert to enter any field where they can be helpful to young men; as far as practicable men are reached through members of the association of the same class or employment.

THE WORLD'S COMMITTEE.—The first world's conference was held in Paris in 1855, at which was adopted the basis on which the associations of all lands have since affiliated: "The Young Men's Christian Associations seek to unite those young men who, regarding Jesus Christ as their God and Saviour, according to the Holy Scriptures, desire to be his disciples, in their doctrine and in their life, and to associate their efforts for the extension of his kingdom among young men." Similar conferences have since been held, triennially as a rule, in the capitals of Europe. In 1878 there was constituted a "central international committee," composed of representatives from all the affiliating national organizations, and with its executive quorum resident in Geneva, Switzerland.

The thirteenth world's conference was held in London in June, 1894, coincident with the fiftieth anniversary of the association of that city, the pioneer organization. Two thousand delegates were present, representing twenty-six nationalities. Among the civic and religious functions were an official reception at the Guildhall; public services at St. Paul's Cathedral and Westminster Abbey, with sermons by the Bishops of London and Ripon; a reception at Royal Albert Hall; and an excursion to Windsor. George Williams, the founder, was knighted by the Queen, and voted the freedom of the city by the London council. Commemorative services were held in nearly 1,500 Anglican and Nonconformist churches of Great Britain.

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HENRY S. NINDE.

Young People's Christian Union: See the Appendix.

Young People's Society of Christian Endeavor: See CHRISTIAN ENDEAVOR.

Youngstown: city; capital of Mahoning co., O.; on the Mahoning river, and the Erie, the Lake S. and Mich. S., the Penn., the Pitts. and Lake Erie, and the Pitts. and West. railways; 67 miles S. E. of Cleveland, and the same distance N. W. of Pittsburg, Pa. (for location, see map of Ohio, ref. 3–J). The business portion of the city lies in a valley on the north side, and the residential streets extend up and beyond the surrounding hills on both sides of the river. The most attractive residence thoroughfare is Wick Avenue. The city has three parks: Wick Park, a natural grove of 48 acres in the northern part of the city, presented by the Wick family; Mill Creek Park, comprising 460 acres, and containing Mill Creek, with the valley, bluffs, and ravines on both sides, from its mouth to Lauterman's Falls, a distance of more than 3 miles; and Idora Park, a resort containing 20 acres, at the terminus of the Youngstown Park and Falls Street Railway Company, 3¼ miles from Central square. It includes an open-air theater, dancing pavilion, carousal, etc. The city derives its supply of water from the river, and has good sewerage, gas and electric-light plants, and electric street-railways traversing the business section, extending from Warren, 15 miles on the W., to Lowellville, 8 miles on the E., and making the circuit of the north and south sides. For manufacturing purposes, coal from near Pittsburg is used, and for domestic purposes, natural gas from Allegheny and Washington cos., Pa. The notable buildings are the county court-house, city hospital, Public Library, Y. M. C. A. building (cost $90,000), jail, opera-house, theater, hotels, Dollar Savings and Trust Company, Elks' Home, and Federal building.

Youngstown has 56 churches, viz.: Methodist Episcopal, 10; Presbyterian, 7; Roman Catholic, 8; Baptist, 6; Lutheran, 7; Protestant Episcopal, 2; Congregational, 2; Disciple, 3; Reformed, 2; Swedish, 2; Hebrew, 2; and Evangelical, 1; missions, 4. There are 20 public-school buildings, with 165 teachers and 6,000 pupils, the Rayen High School with large endowment, 6 Roman Catholic parochial schools, 3 Lutheran parochial schools, several business colleges, private and free kindergartens, and classes for self-supporting women maintained by the Women's Industrial and Educational Union.

In 1900 the municipal receipts were $270,203; disbursements, $218,792; the assessed valuation was $13,314,710; net debt, $429,096; value of water-works, owned by the city, $750,000. In 1900 there were 5 national banks with combined capital of $1,429,000, and 2 savings-banks with capital of $150,000. The total deposits were $3,900,000; loans, $4,700,000.

The city has large wholesale and retail mercantile establishments, foundries, machine-shops, lumber-yards, flour-mills, bridge, car, tube, and boiler-works. Its principal industry is the manufacture of iron. The annual capacity of 7 blast furnaces is over 500,000 tons, and of 6 rolling, puddling, and finishing plants, 981,000 tons. In 1900 there were 110 incorporated companies in the city, with aggregate capital of $18,000,000.

The site of the present city and township of Youngstown was purchased from the Connecticut Land Company in 1800 by John Young, who settled there in 1799. The first rolling-mill (the second in the State) was erected in 1845–46, and the first furnace in 1846. Pop. (1880) 15,435; (1890) 33,220; (1895) estimated, 43,000. EDITOR OF "TELEGRAM."

Young Women's Christian Associations: organizations devoted to the physical, social, intellectual, and spiritual development of young women. The first of these associations was founded in London, England, in 1855. In the U. S. they were the outgrowth of the Ladies' Christian Union established in New York in 1858. The object of this organization was to further the welfare of women, especially of young women dependent on their own efforts for support. To attain this it was designed to form an association on the model of the Young Men's Christian Association, and an attempt was made in Boston in 1859, but the opposition of members of the clergy, who feared that the creation of this new field of activity would withdraw the energy of young people from church work, discouraged the originators of the plan, and nothing was done until 1866, when a Young Women's Christian Association was founded in Boston—the first association organized under that name. By 1871 there were in the U. S. three organizations bearing that name and twenty-seven with other names, mostly Women's Christian Associations, all doing kindred work. In that year, in order to give mutual encouragement and promote harmony of action, there was instituted the practice of holding biennial conferences which have met regularly since that date. The conference of 1879, at which delegates from Canada and Europe were present, adopted the name of International Conference, which has since been changed to the International Board of Women's and Young Women's Christian Associations; but this body has merely a deliberative character and exercises no control over the individual associations. It admits as members all organizations for improving the condition of women, especially those who are self-supporting.

There is also a distinct organization of Young Women's Christian Associations that originated in the colleges. In Nov., 1872, the first college Young Women's Christian As-

sociation was organized in the State Normal University, Normal, Ill., and by 1885 there were about one hundred associations in various colleges in the U. S., under nine State organizations. A national organization was formed in 1886, and in 1889, on the union with Canadian associations, this was merged into the International Association of Young Women's Christian Associations, which holds biennial meetings and extends its membership to any association in either city or college which does a work for and by young women, and whose voting and office-holding membership is composed of women who are members of Protestant Evangelical churches. Young Women's Christian Associations have been established in several European countries, and in 1892 a world's committee was organized with its headquarters in London. In the latter city, in 1894, the membership of the associations was estimated at 14,000.

While at first the work of the organizations was modeled on that of the Young Men's Christian Associations, it was soon found that among women the requirements were more varied. A valuable and important feature of their work is the maintenance of boarding-homes for young women. In addition to these, the city associations have gymnasiums, educational classes, entertainments, lectures, employment bureaus, and other means for promoting the intellectual and social interests of their members. Since their foundation they have increased steadily in number. In 1895 there were about eighty associations represented in the International Board of Women's and Young Women's Christian Associations, and their membership was estimated at 23,000. In the International Association of Young Women's Christian Associations in 1895 there were 61 city associations, 280 college associations, and the total membership was over 24,000.

Ypres, ec'p'r: town; province of West Flanders, Belgium; on the Yperlee; 30 miles S. S. W. of Bruges by rail (see map of Holland and Belgium, ref. 10–B). It was in the fourteenth century one of the leading manufacturing centers of Europe, and had about 200,000 inhabitants. A splendid monument of that time is the cloth-hall, a large structure in Gothic style, built in the thirteenth and fourteenth centuries, and now occupied by different public establishments. In the sixteenth century Ypres began to decline, and its present manufactures, though very varied, comprising linen, woolen, cotton, and silk, lace, and ribbons, oil, soap, salt, and leather, are comparatively of little consequence. Its former fortifications are now dismantled and transformed into promenades. Pop. (1891) 16,505.

Ypsilan'ti: city (site of Indian trading-post in 1807, located in 1824, chartered as a city in 1858); Washtenaw co., Mich.; on the Huron river, and the Lake S. and Mich. S. and the Mich. Cent. railways; 8 miles S. E. of Ann Arbor, 30 miles W. by S. of Detroit (for location, see map of Michigan, ref. 8–J). The city is laid out chiefly in regular squares, is on both sides of the river, and owns the water-works and electric-light plant. A peculiarity of the water system is the use of an elevated tank with capacity of 250,000 gal., instead of the usual stand-pipe. The tower is of stone and the tank of steel. There are 10 churches and places of worship, State normal school, St. John's Academy, 4 public schools, business college, a national bank with capital of $75,000, a State bank with capital of $50,000, and 3 weekly newspapers. The manufactures include underwear, paper, tags and labels, flour-mill machinery, agricultural implements, pumps, and sash, doors, and blinds. In 1895 the city had an assessed valuation of $2,420,000, and a bonded debt of $148,500, all of which, excepting $19,500, was for its water-works and lighting-plant. Pop. (1880) 4,984; (1890) 6,129; (1900) 7,378. EDITOR OF "SENTINEL."

Ypsilanti: name of an illustrious Greek family of princely rank, descendants of the Comneni of Trebizond and prominent as champions of the emancipation of Greece. (1) ALEXANDER: statesman; b. at Constantinople 1725; hospodar of Wallachia 1774–82, and again 1796–98, and of Moldavia 1784–92. Executed, for treason, at Constantinople in 1805.—(2) CONSTANTINOS: statesman and writer; son of (1); b. at Constantinople, 1760; hospodar of Moldavia 1799–1801, and of Wallachia from 1802 to 1806, when he was removed on account of his Russian proclivities. Soon reinstated, he was forced to flee to Russia in 1808, and died at Kiev in 1816. He was an able linguist and prolific writer. He left eight children.—(3) ALEXANDER: revolutionist; son of (2); b. at Constantinople, Dec. 12, 1792; served in the Russian army and lost his right hand at the battle of Dresden (1813); was made adjutant to Alexander I. and major-general in 1817. In 1820 he was chosen chief of the *hetæria*, a secret association, the object of which was the liberation of the Greeks from the Ottomans. He invaded Moldavia with a force of Greek and Russian volunteers, but was entirely defeated at the battle of Dragashan (June 19, 1821). Escaping to Austria, he was arrested by the Austrian authorities, and confined for six years in the fortress of Munkács. D. in Vienna, Jan. 31, 1828.—(4) DEMETRIUS: revolutionist; son of (2); b. at Constantinople, Dec. 25, 1793; served in the Russian army; joined the Greeks in the Morac in 1821, and distinguished himself at the capture of Tripolitza, the defense of Argos, and the battle of Lerna against Ibrahim Pasha. In 1828 he was appointed commander in chief of the Greek army, but disagreement with the president Capodistrias caused his resignation in 1831. D. in Vienna, Jan. 3, 1832. EDWIN A. GROSVENOR.

Yquitos: another spelling of IQUITOS (*q. v.*).

Yreka, wī-ree'kăa: city (founded in 1851); capital of Siskiyou co., Cal.; on the Yreka creek, and the Yreka Railroad; 25 miles S. of the Oregon State line, 360 miles N. of San Francisco (for location, see map of California, ref. 2–B). It is in an agricultural, fruit and stock raising, and lumbering region, and has 3 churches, high school, grammar school, a State bank with capital of $100,000, and 2 weekly newspapers. Pop. (1880) 1,059; (1890) 1,100; (1900) 1,263. EDITOR OF "JOURNAL."

Yriarte, Span. pron. ee-rec-aar'tā, CHARLES ÉMILE: writer; b. at Paris, Dec. 5, 1832, of a family of Spanish descent. He studied architecture at the École des Beaux Arts, and in 1856 became inspector of the imperial asylums, and a little later of the Opéra at Paris. Attracted, however, by the freer life of the journalist, he went in 1859 as correspondent of the *Monde Illustré* to the Spanish war in Morocco. In 1860–61 he followed the war in Italy in the same capacity. Returning to Paris in 1862, he became editor-in-chief of the journal. In 1871 he resigned this position and for several years devoted himself to travel and the study of the history of art. In 1881 he was appointed inspector of the École des Beaux Arts. Yriarte's literary works fall into several very distinct groups. First, we have a series of impressions of war and of society in and out of Paris. Here belong *La société espagnole* (1862); *Sous la tente: souvenirs du Maroc* (1862); *Paris grotesque, les célébrités de la rue 1815–63* (1864); *Les cercles de Paris 1828–64* (1865); *Portraits parisiens* (1865); *Nouveaux portraits parisiens* (1869); *Portraits cosmopolites* (1870); *Tableaux de la guerre* (1870); *Les Prussiens à Paris et le 18 Mars* (1871); *Campagne de France 1870–71* (1871); *La Bosnie et l'Herzégovine pendant l'insurrection* (1875). In the second place, we have a series of studies of life and society in Italy during the Renaissance: *La vie d'un patricien de Venise au XVIe siècle* (1874; crowned by the French Academy); *Un condottiere au XVe siècle: Rimini* (1882); *Françoise de Rimini* (1882); *Matteo Civitali* (1885); *César Borgia* (2 vols., 1888); *Autour des Borgia, les monuments, les portraits* (1890). In the third place stand several contributions to the history of art: *Goya, sa vie et son œuvre* (1867); *La sculpture italienne au XVe siècle* (1885); *J. F. Millet* (1885). Closely allied to these last are the magnificent illustrated works: *Venise: l'histoire, l'art, l'industrie, la ville et la vie* (1877); *Les bords de l'Adriatique et le Monténégro* (1877); *Florence et l'histoire des Médicis* (1880). Last we may mention the historical sketches *Les princes d'Orléans* (1872); *La bataille de Dorking* (1872); *Le Puritain* (1873). Over his own name and the pseudonyms Junior, Marquis de Villemer, etc., Yriarte has written much for the *Figaro* and other Parisian journals. A. R. MARSH.

Yriarte, or **Iriarte**, JUAN, de: Spanish scholar; b. Dec. 15, 1702, at Orotava on the island of Teneriffe; d. in Madrid, Aug. 23, 1771. After studying the ancient languages at Paris and jurisprudence at Madrid, he obtained a position in the royal library at the latter place. In 1732 he became chief librarian. In 1742 he was appointed also official translator for the ministry of Foreign Affairs. His most important literary work had to do with the library in which he worked, and particularly valuable was his *Codices græci manuscripti*, of which, however, but one volume ever appeared (Madrid, 1769). As *parerga* he wrote many epigrams and proverbs in both Latin and Spanish, narrative poems in Latin, etc. All were published in his *Obras sueltas* (4 vols., Madrid, 1774). Selections from his poems and letters are printed in volumes lxii. and lxvii. of Rivadeneyra's *Biblioteca de Autores Españoles*. A. R. MARSH.

Yriarte, or **Iriarte**, Tomas, de: Spanish poet and dramatist: nephew of Juan de Yriarte; b. at Orotava (Teneriffe), Sept. 18, 1750; d. in Madrid, Sept. 17, 1791. He went in early childhood to Madrid, and was there educated under the eye of his learned uncle. As a mere boy he began to write verses, and when only eighteen he had completed the comedy *Hacer que hacemos*, published in 1770 under the name Tirso Ymareta. In 1771 he was given the office left vacant by his uncle's death, and in 1776 he became also archivist of the ministry of War. In 1780 appeared his excellent didactic poem *La música*, which attracted attention outside of Spain. In 1782 he published his *Fábulas literarias*, which still remain the best poetical fables in the Spanish tongue. He also has the distinction of having written the first regular comedies in Spanish, the best specimens being *El señorito mimado* (1778) and *La señorita mal criada* (1788). He translated into Spanish several French plays, Horace's *Ars poetica* (1777), and four books of Vergil's *Æneid*. Having become involved in literary animosities, he was toward the end of his life charged with leaning toward the recent French philosophy. For this cause he was summoned before the Inquisition in 1786, but no harm ensued. The first collection of his *Obras*, edited by himself, appeared in 6 vols., Madrid, 1787. More complete is the edition in 8 vols., 1805. His poems are printed in vol. lxiii. of Rivadeneyra's *Biblioteca de Autores Españoles*.

Ysaye, ĕē-zā′, Eugène: violinist; b. in Liège, Belgium, July 16, 1858; studied in the Conservatory of Liège till 1874, then received private lessons from Wieniawski at Brussels. He made concert tours over Europe with great success. In 1884 he was decorated Knight of the Royal Oak by the King of Holland; in 1886 was appointed high professor in the Royal Conservatory of Brussels; went to London for the first time in 1889, and in the autumn of 1894 visited the U. S., playing with immense success everywhere. D. E. Hervey.

Ysleta, ĕēs-lā′tăă: city; El Paso co., Tex.; on the Rio Grande river; and the South. Pac. and the Tex. and Pac. railways; 12 miles E. of El Paso, the county-seat (for location, see map of Texas, ref. 3–A). It is in the heart of the fertile Rio Grande valley, has large agricultural and fruit-growing interests, and does its banking in El Paso. Coronado's expedition of 1540 discovered a settlement of Pueblo Indians here, established a colony, and built a church. Descendants of these Pueblos still occupy part of the city, which is believed to be the oldest in the State. Pop. (1880) 1,453, nearly all Mexicans and Indians; (1890) 1,528, about one-third citizens of the U. S.; (1900) 1,771.

Yssel, ī′sel, or **Ijssel**: a branch of the Rhine, separating from it near Arnhem in the Netherlands. It receives the Old Yssel, which comes from Rhenish Prussia, and enters the Zuyder-Zee after a course of 80 miles.

Yttrium [Mod. Lat.; so named because first detected in gadolinite found at Ytterby, in Sweden]: a rare metal belonging to the cerium group; atomic weight (Cleve) 89·6, or, according to Bunsen and Bahr, 92·5, symbol Y. Cleve prepared the metal by the electrolysis of the double chloride of yttrium and sodium, and also by fusing this salt with sodium. It was thus obtained as a dark-gray powder with a metallic luster under the burnisher. It decomposes cold water slowly and boiling water more quickly. It is most easily recognized by the spark spectrum of the chloride (YCl_3), which contains a large number of bright lines. Of these, two groups near the sodium line toward the red are characteristic.

Yttrium oxide (Y_2O_3), or yttria, is obtained as a yellowish-white powder by igniting the oxalate or hydroxide. It is not directly soluble in water, but dissolves slowly in nitric, hydrochloric, and sulphuric acids, forming sweetish salts—namely, $Y(NO_3)_3 + 6H_2O$, $YCl_3 + 6H_2O$, and $Y_2(SO_4)_3 + 8H_2O$ respectively. Pure yttrium and erbium salts were prepared by Bunsen and Bahr, who first decomposed the mineral gadolinite by heating it with strong hydrochloric acid and then precipitated the chlorides of the contained metals with oxalic acid. By further treatment they separated out the salts of cerium, lanthanum, etc., and formed oxides, nitrates, and oxalates alternately.

Yttrium occurs as a silicate and as yttria in gadolinite, a mineral with a vitreous luster, usually found in masses of a black or greenish-black color; as a phosphate in Xenotime (*q. v.*); and as a fluoride in yttrocerite, a mineral found near Fahlun, Sweden; at Amity, Orange co., N. Y.; and at Paris, Me. R. A. Roberts.

Yuba River: a river of California, rising by three forks, (the North, Middle, and South), which flow through deep, cañon-like gorges in the Sierra Nevada. The united stream joins Feather river at a point just below Yuba City.

Yucatan, yoo-kăă-taan′: a peninsula of Southeastern Mexico, projecting northward between the Gulf of Mexico and the Caribbean Sea, and separated from the western extremity of Cuba by a channel about 140 miles wide. It embraces the two states of Campeachy (*q. v.*), occupying about one-fourth of the peninsula in the southwest, and Yucatan. The latter has an area of 28,180 sq. miles and an estimated population (1893) of 365,810. Unlike the main body of Mexico, Yucatan is not mountainous except in the southern part, which is physically a portion of Central America. The surface is generally rolling or hilly. There is comparatively little heavy forest except in the southern mountains or on swampy flats adjoining the coast. Though rains are abundant in their season, many districts are almost without running water. For this reason much of the land is unfitted for ordinary agriculture; but it is well adapted for grazing and for the cultivation of sisal hemp, which is now the staple product and export. The mines are unimportant. The climate is warm and somewhat insalubrious. The civilized population is gathered in the northern part. Merida, the capital, and its seaport, Progreso, are the most important towns. The southern districts are still held by Indians, who are only nominally subject to the Mexican Government. Yucatan was the first portion of Mexico visited by the Spaniards 1517–19. (See Cordova, Francisco Hernandez, de, and Grijalva.) It was crossed by Cortés on his way to Honduras (1525), and was partly conquered by Montejo 1527–49. The Indian inhabitants of the Maya race (see Indians of Central America) had attained a considerable degree of civilization, and their skill in architecture is still shown by the ruined cities of Uxmal, Chichen, etc. (*qq. v.*). They resisted the Spaniards bravely, but eventually the northern tribes were subdued and their descendants form a large portion of the inhabitants. The Maya language is still in general use in the interior, and is spoken even in Merida. Yucatan was attached to New Spain or Mexico, and followed its revolutions more or less willingly until 1839, when it seceded and formed an independent state. It was reunited to Mexico in 1843. In 1847 the Indian population revolted, holding a large part of the peninsula for several years and even threatening Merida. See Fancourt, *The History of Yucatan* (1854); Baqueiro, *Ensayo histórico sobre las revoluciones de Yucatán* (3 vols., 1871–72); the works of Stephens, Brasseur de Bourbourg, and Le Plongeon; also see Central American Antiquities. Herbert H. Smith.

Yucatecs: inhabitants of Yucatan; a name often given to the Mayas (see Indians of Central America).

Yucca [Mod. Lat., from *Yuca*, the native (San Domingan) name]: the aboriginal and also the botanical name of a genus of peculiar liliaceous plants, species of which have the English names of bear-grass, dagger-weed, Spanish bayonet, etc., natives of North America from New Jersey and from Iowa to Yucatan, but most abundant between the 25th and 35th degrees of N. lat. From fifteen to twenty species are well characterized (by Dr. Engelmann and Dr. Trelease), with many varieties, and various doubtful forms are in cultivation. The stems of the more northern species are subterranean, so that the tuft of bayonet or dagger shaped leaves is next the ground; of the more southern, arborescent, and palm-like in some species, forming a trunk 10 to 20 feet high, crowned by a dense tuft of prickly-pointed leaves. In *Y. filamentosa* and some other species delicate threads separate from the edges of the needle-pointed leaf, whence the popular appellation, Adam's needle and thread. The framework of the leaves affords a valuable fiber, which is used for cordage by the Mexicans. The root-stocks are replete with mucilaginous and saponaceous matter, which, under the name of "amole," serves as a substitute for soap in many a Mexican household, is also used by the Negroes of the Southern U. S., and gives the common name of soap-plant to *Y. glauca* (*Y. angustifolia* of the books), which abounds between the Mississippi and the Rocky Mountains. A stalk rising from the center of the crown of foliage bears an ample panicle of large and white lily-like blossoms, showy at all hours, but most so at evening, when the blossoms fully spread. The fruit is dry and capsular in some species, fleshy and baccate in others. The latter are edible and savory. That of *Y. aloifolia*, the "Spanish bayonet," is eaten by the Negroes of the coast of South Carolina and

Georgia under the name of banana, which it somewhat resembles in appearance; that of *Y. baccata* of Arizona, etc., is largely consumed when fresh by whites and Indians, and is cured by the latter for winter provisions. Several species are planted for ornament, and are much prized in landscape gardening. Revised by C. E. Bessey.

Yuchee Indians: See Uchean Indians.

Yu'kian Indians: a family of North American Indians. *Yuki*, the name of one of the tribes, is of Wintun origin, signifying *stranger* or *enemy*, secondarily *bad* or *thieving*. The principal tribes are the Yuki, whose priscan home was the territory now known as Round valley, Mendocino co., Cal.; the Chumaia, in Eden valley and on Middle Eel river; the Tatu, or Huchnom, in upper Potter valley; the Ashochimi, or Wappo, whose ancient range extended from the geysers to the Calistoga Hot Springs and in Knight's valley; and the Napa, in upper Napa valley.

The physical appearance of the Yuki is not pleasing. They have disproportionately large heads, small bodies, and rather protuberant abdomens; their eyes are small, but keen and restless; their noses stout, short, and straight, with expanded nares. They have heavy shocks of bristly hair, which they cut short, and their complexion varies from yellowish buff to almost black. The women tattoo the cheeks, nose, mouth, and chin with pitch-pine soot and a sharp-pointed bone. Stephen Powers describes this tribe in 1877 as "a truculent, sullen, thievish, revengeful, and every way bad, but brave race." The Tatu, on the contrary, were regarded as remarkably timid. The Ashochimi are of finer physique than the Yuki, having less angularity and coarseness of feature, more prominent chins, and brighter eyes.

Before being confined to a reservation these tribes built conical lodges of poles, bark, and puncheons on elevated ground. The dwellings of the Tatu, or Huchnom, were sometimes oblong and very large, with sleeping room for thirty or forty persons. Their ceremonial lodge or tribal assembly-hall is a dome-shaped structure covered with thatch and earth, and is capable of containing probably 200 persons. In this lodge the Yuki perform their annual green-corn dance, engaged in by both men and women. The Tatu observe an open-air acorn dance, in which both sexes also participate. The men of all the tribes of this family are fearless hunters, entrapping even grizzly bears in snares made of wild flax, then killing them with sharp, fire-hardened sticks.

The Ashochimi cremate their dead, casting the ashes, which are believed to contain the spirit, to the wind. The Tatu bury their dead usually with the head to the N., while the Yuki Indians inter the corpse in a sitting posture. The Yuki recognize a Supreme Being, the creator of the world, and its first inhabitant, but it is probable that this belief is the result of Christian contact. Both the Ashochimi and Tatu regard the owl and the hawk as potent and malignant spirits, which they conciliate by offerings and by wearing mantles of their feathers. Snakes are also an object of superstitious belief and awe. Like most primitive peoples, the Yuki have a deluge legend.

Authorities.—Stephen Powers, *Tribes of California* (Contr. N. A. Eth., iii., Washington, 1877); H. H. Bancroft, *History of California* (vols. i.–viii., San Francisco, 1884–90). See Indians of North America. J. W. Powell.

Yukon River; one of the great rivers of the world. Of the streams of North America it is second in drainage area, and probably second in volume. Its length is about 2,000 miles, and its hydrographic basin, one-half of which lies in Alaska, approximately 440,000 sq. miles in extent.

The position of its source has been variously reported by explorers, and is not yet definitely determined. The main valley leads to Lake Teslin, in Northwestern Canada, lat. 60°, lon. 132°. On its head waters there are numerous large lakes, in the midst of grand scenery, some of which are clear, while others are turbid with glacial mud. The tributaries from the N. traverse a forested and moss-covered region, and are mostly clear and limpid; while the larger branches from the S. flow from glaciers on high mountains, and are turbid and heavy with silt throughout the year. The Yukon is an intensely muddy stream, except near its source, and is building an immense delta where it enters Bering Sea. The head of the delta, or where the river first divides, is more than 100 miles from the sea; and its seaward margin measures about 70 miles. The delta has not been surveyed. For this reason, and also because of the shallowness of the sea near where the river discharges, oceangoing vessels do not approach it. The transfer of goods intended for the Yukon trade, to river steamboats is made at St. Michael's, 70 miles to the N.

The Yukon river has been ascended by small, stern-wheeled steamboats as far as Selkirk House, 1,500 miles, but this is not the head of navigation. Several of the tributaries of the main stream are also navigable. The Porcupine, which comes in from the N. E. and joins the Yukon near Ford Yukon, under the Arctic Circle, has been ascended by steamboats 150 miles. Other tributaries, several of which are larger than the Porcupine, have not been explored. The season of navigation is usually from the middle of June to the middle of October.

The climate of the lower Yukon is exceedingly humid, but grows drier on ascending the river. E. of the 141st meridian, the eastern boundary of Alaska, the summers are dry and hot, and the winters intensely cold, with a light snowfall. The delta of the Yukon is treeless, and forms a part of the tundra that fringes the coast of Bering Sea and the Arctic Ocean. About 70 miles from the sea spruce forests begin and continue all along the river and its many branches to near its head waters. As the climate becomes drier toward the interior of the country, the forests on the uplands are less dense. In Eastern Alaska and adjacent portions of Canada the hills are grass-covered and separated by belts of spruce, cottonwood, willow, and other trees, which grow along the streams.

The river is solidly frozen in winter. In spring, thawing begins first on its head waters, and great floods occur on account of the ice gorges that are formed. On the banks of the river layers of ice are exposed in many places, beneath the moss that covers the ground in the forests, solid ice of unknown thickness may frequently be found even on hot summer days. The Yukon is a highway of travel for the natives. The Eskimos use skin boats, *kyaks*, and the Indians birch-bark canoes. In winter long journeys are made on sleds drawn by dog-teams.

Gold is found in the river gravels of the upper Yukon, and along many of its branches. The center of this industry is now on Forty-mile creek, just within the eastern boundary of Alaska. About 1,000 miners were at work in that region in the summer of 1894. The gold is obtained by washing the gravel in sluices.

See Dall, *Alaska and its Resources* (1870) and Report in Eleventh U. S. Census. Israel C. Russell.

Yule [M. Eng. *yol* < O. Eng. *gēol*; Icel. *jōl*; Swed. *jul*; cf. O. Eng. *gēola*, December or January, Icel. *Ylir*, a winter month, and Goth. *jiuleis*, November or December]: the old Teutonic name of Christmas, or, properly speaking, of the religious festival of the winter solstice. Though the nature of the festival has been completely transformed by Christianity, and though the mode of celebrating has also been much changed, in the greenery with which we still deck our houses and temples of worship, and in the Christmas-trees laden with gifts, we still have relics of the symbols by which our heathen forefathers signified their faith in the power of the returning sun to clothe the earth again with green and hang new fruit on the trees.

Yule, Col. Sir Henry, K. C. S. I., C. B.: Anglo-Indian official and scholar; b. at Inveresk, Midlothian, Scotland, May 1, 1820, and educated at the Edinburgh High School. In 1837 he entered the East Indian Company's Military School at Addiscombe, and at the end of 1858 was appointed to the engineer service. After the usual period of instruction at Chatham he was sent to India, and was there employed on public works in different parts of the country, until 1862, when he retired and went to reside in Italy. D. Dec. 30, 1889. His principal works are *Mission to the Court of Ava* (1858); an edition of the *Mirabilia Descripta* of Friar Jordanus (1863); *Cathay and the Way Thither* (1866); the *Book of Ser Marco Polo* (2 vols., 1871; new ed. 1875); *Glossary of Anglo-Indian Terms*, begun in concert with his friend Burnell (1886); and the *Diary of William Hedges* (3 vols., 1889), besides many papers in the *Journal* of the Royal Asiatic Society, etc.

Yuma: city; capital of Yuma co., Ariz.; on the Colorado river, and the South. Pac. Co.'s railway; 150 miles W. by S. of Phœnix and 250 miles S. E. of Los Angeles, Cal. (for location, see map of Arizona, ref. 13–J). It is principally engaged in mining, agriculture, fruit-growing, and general trade, and has 2 public-school buildings and 2 weekly newspapers. Pop. (1880) 1,200; (1890) 1,773; (1900) 1,402.

Editor of "Arizona Sentinel."

Yuman Indians [*Yuma*, the name commonly applied to the Cuchan tribe, is said to mean "sons of the river"]: a family or linguistic stock of North American Indians. The tribes composing it occupied an area extending from the Cataract Cañon of Colorado river, Northern Arizona, to the southern extremity of Lower California, including the greater portion of the lower Colorado and Gila river drainage in Western, Central, and Southwestern Arizona, the larger part of California S. of lat. 35°, and a small area in Western Sonora, Mexico. The divisions of the stock are:

Cochimi. The most populous of the Lower California groups, embracing a number of small tribes, formerly between lat. 26° and 31°, principally about Loreto Mission. In the eighteenth century they numbered probably 7,000 or 8,000 in about sixty settlements. Only a few now survive.

Cocopa. This tribe, including seven bands of indeterminate status, in early historic times held the valley of Colorado river from its mouth almost to the Gila junction, as well as the mountains of Northern Lower California. They are of more peaceable character than the Cuchan and Mohave, but like them are agriculturists, their principal products being corn, wheat, pumpkins, and melons. Population about 500, mostly in Mexican territory.

Comeya. A term formerly of indefinite application, being used collectively to designate the tribes from San Diego for 100 miles inland, and even to Colorado river, thus including the Diegueños, but now applied to a group of six insignificant tribes about New river on both sides of the California and Lower California boundary. The name is now obsolete, the Indians apparently being classed officially as "Yuma."

Cuchan, more commonly called Yuma; a tribe north of the Cocopa, on both sides of Colorado river from 50 miles above its mouth to 60 miles above the Gila confluence. Physically the Cuchan are much superior to the Cocopa, though perhaps inferior to the Mohave. They are peaceable yet brave, and excepting the Tulkepaia division are agriculturists, raising crops similar to those of the Cocopa. The Tulkepaia, numbering 240, are now under the San Carlos agency, Southeastern Arizona. There are also 760 "Tonto Apache" under the San Carlos agency, part of whom belong to this tribe. The population of the "Yuma" (mainly Cuchan) of Yuma reservation, California, is 1,208.

Diegueño (so named from San Diego mission, established in their midst in 1769). The name has no ethnic significance, being a collective term for several small tribes (at least one of which belonged to the Comeya) formerly in a number of *rancherias* in Southern California. They are now classed as Mission Indians under the Mission Tule agency. Population about 410.

Havesupai, also called Avesupai, Cosnino, Supai, etc. An isolated tribe, numbering 224 souls, who make their home in the gorge of Cataract creek, a side cañon of Colorado river, Northwestern Arizona. They bear closer linguistic affinity to the Walapai than to any other Yuman tribe, though in everything save language they resemble more closely the Pueblo tribes than their kindred.

Maricopa (formerly called Cocomaricopa). The priscan habitat of this tribe was the Gila and the western bank of the Colorado, near their confluence in Southwestern Arizona and Southeastern California; but for mutual protection they joined the PIMAN INDIANS (*q. v.*), with whom they have resided in historic times on the Gila and Salado between lon. 112° and 113°. They are an agricultural tribe, their principal product being wheat, which is raised by irrigation. Their customs are similar to those of the Pima, with whom they intermarry, but they retain their native language. Population, 309 in 1891.

Mohave, or *Mojave* (from *hamok*, three, and *habi*, big rock or mountain, hence "three mountains," in allusion to the rocky buttes or The Needles, on the eastern side of Colorado river, about lat. 34° 41′, Western Arizona, which, so far as known, was their earliest habitat). This is the largest of the Yuman tribes. Physically the Mohaves are among the finest specimens of the North American Indian. They live in commodious, well-made houses of thatch and earth supported by posts, each house being supplemented by a large wickyup or ramada. So far as known the tribe has fourteen clans, one of them being an adopted band of Maricopa. They are now mainly under the Colorado river agency, California, where they numbered 1,991 in 1891.

Yavapai (from *e-nyae'va*, sun + *pai*, people); also, but improperly, called Yampai. These are the Nijora (Pima for captive) of the early Spanish missionaries, and the so-called Apache-Mohave (i. e. wild Mohave) of the present time. The Yavapai are strictly Mohave who left the main tribe in the Colorado river valley, and occupied the range of country between Bill Williams Fork and the Rio Santa Maria as far as the Castle Dome Mountains near the Gila. When they were removed to the Camp Verde agency in 1873 they claimed the Rio Verde country and the Black Mesa from the Rio Salado northward to Bill Williams Mountains. Since 1875 they have been under the San Carlos agency, where they numbered 557 in 1891. They have intermarried extensively with the Apache.

Pericu. This linguistic division of indefinite status included a number of small tribes formerly in Lower California from La Paz, about lat. 24°, to Cape St. Lucas. So far as known there are no survivors.

Seri (also Ceri). This is a small semi-nomadic tribe occupying an area on the coast of Sonora, Mexico, about lat. 29°, and the adjacent island of Tiburon in the Gulf of California. They subsist chiefly on fish, turtles, and waterfowl, generally eaten raw, using pelican skins as clothing and bedding. They are of fine physique, and are noted as runners. In the seventeenth century they gained an unenviable reputation for ferocity and cruelty, and while a part of the tribe were subdued by the Mexicans and surrounding Piman tribes in 1770, the remnant retain their savage character. They are probably the most primitive and bloodthirsty Indians remaining in North America. Their principal inland settlements in early days were about El Populo and the present Hermosillo, but these localities have long been abandoned. In 1852 they were said to number 500 on Tiburon island; in 1894 they were visited by McGee, when for the first time extensive collections and photographs were made among them, and found to number about 75 warriors with some 200 women and children. The Seri have been classed as Yuman on meager linguistic evidence, but the latest researches indicate that they probably form a distinct family.

Tonto (Spanish "foolish," "stupid"). A name inappropriately and indiscriminately applied (1) to the Tulkepaia or "Apache-Yuma," on San Carlos reservation; (2) to an Athapascan tribe commonly known as the Coyotero Apache; (3) to the Pinal or Pinaleño of the same stock; (4) to a body of Indians mostly Yavapai men and Pinal women who have intermarried. The term is applied more particularly to the last-mentioned class, who, before their removal to the Rio Verde reservation and afterward to the San Carlos agency, made their home in Tonto Basin and the Pinal Mountains in Eastern Central Arizona. They speak a Yuman-Apache jargon, and number 750.

Waikuru. A collective term applied to the tribes of Lower California, formerly between the Cochimi on the N. and the Pericu on the S., or from lat. 24° to 26°. They spoke four dialects—Cora (distinct from the Piman Cora), Uchiti, Aripe, and Callejue, none of which probably now exist in their native purity.

Walapai (also Hualapai, Wolapai, from a term said to signify "pine people"). This tribe originally occupied the middle Colorado river, above the Mohave territory, from the great bend eastward into Walapai, Yavapai, and Sacramento valleys. The southern boundary of their range was the Cerbat and Aquarius Mountains. They are physically inferior to the Mohave. Population, 700.

Missions were established among the Lower California tribes by the Jesuits in the seventeenth and eighteenth centuries, when the native population of the peninsula was estimated at about 12,000. In 1769 the first mission of Northern California was founded at San Diego, and in 1780 two missions were established among the Cuchan near the present Fort Yuma, but the latter were destroyed and the missionaries killed by the Indians the following year.

During the mission period the Yuman stock doubtless numbered at least 20,000 souls. The present population within the limits of the U. S. is 6,400, and a few are still to be found in the California peninsula. See INDIANS OF NORTH AMERICA.

AUTHORITIES.—J. Baegert, *Nachrichten von der amerikanischen Halbinsel Californien* (Mannheim, 1772); *ibid.*, Rau's trans., Smithsonian Inst. *Reports* for 1863–64; Pacific Railroad *Reports*, iii. (Washington, 1856); Gatschet, *Der Yuma-Sprachstamm*, in *Zeitschrift für Ethnologie* (Berlin, 1877–92); Orozco y Berra, *Geografía de las lenguas y carta etnográfica de México* (Mexico, 1864); H. H. Bancroft, *Arizona and New Mexico* (San Francisco, 1889); M. Venegas, *Hist. Cala.*, vols. i.–ii. (London, 1759); F. S. Clavigero, *Hist. Mex.*, Cullen's trans., vols. i.–ii. (London, 1807).

J. W. POWELL.

Yuncan Antiquities: The Yuncas or Chimus inhabited the coast of Peru, and were a different stock from the Kechuas of the interior. (See INDIANS OF SOUTH AMERICA.) They were conquered by the Kechuas about a century before the arrival of Pizarro, but they did not owe their culture to that people, having independently reached a comparatively close approximation to a civilized condition. (See INCAN ANTIQUITIES.) One of the most celebrated localities is Pachacamac, 20 miles S. of Lima, on the river Lurin. It was the capital and sacred city of the natives before their conquest by the Incas. The ruins consist of walls and terraces covering 8 or 10 acres. The material is usually large adobe or sun-burned bricks, and many of the structures are still in a fair state of preservation. A remarkable feature is the presence of the true rounded arch, probably the only correct example of this architectural element to be found in America. It is not confined to Pachacamac, but occurs in other Yuncan ruins along the coast. In this, in the use of undressed stones laid in a mortar of tenacious clay, in the extensive use of adobes, and in the style of mural ornamentation, the Yuncan method of building shows differences from the Incan which are readily recognized. They were, however, able to handle stone to advantage, as is testified by the remains of the Castle of Cañete in the valley of Guarco and elsewhere.

In the vicinity of Lima there are many ruins attributable to this people. One of the most extensive are those of Caxamarquilla, about 15 miles from Lima, in a side valley of the river Rimac. They cover an area of about 3 miles square, and are a complicated mass of adobe walls, streets, narrow passages, subterranean chambers, and mounds. Much more extensive are the remains of the city called El Gran Chimu, on the plain of that name, not far from Truxillo. They cover the ground with a wilderness of walls, inclosures, mounds, and passageways, over an area 12 to 15 miles long and 5 to 6 wide. Several miles of the massive wall of defense which once protected the inhabitants are still standing. The truncated pyramids which supported the foundation of these structures were of imposing size, measuring, one 162 feet square, another 210 by 240 feet, a third 172 by 152 feet, and in height from 40 to 50 feet. Most of them are built of rubble, that is, of tenacious clay mixed with broken stones, so as to form an indurated mass, which in that dry climate becomes almost as hard as mortar. Not far from Chimu is the great pyramid of Moche, sometimes called the Temple of the Sun. Its base covers an area of more than 7 acres, and its height is upward of 200 feet. It is constructed throughout of large adobes built around a central core, and cased externally with others laid flat upon the sides. Near by is another pyramid of smaller size and similar construction. The purposes of these laborious structures is not known, but it is conjectured that they were the supports of religious edifices which have now wholly disappeared.

From the pottery, ornaments of metal, and domestic utensils which have been exhumed in this vicinity the inference is fair that the Yuncas were as highly developed in their culture as any other of the Peruvian peoples. See E. G. Squier, *Travels in Peru* (1877); de Nadaillac, *Ancient America* (1882); Rivero and Tschudi, *Peruvian Antiquities* (Vienna, 1851). D. G. BRINTON.

Yun-ho (literally, transport river), or **Yun-liang-ho** (grain-transport river): the names by which the Grand Canal of China is known to the Chinese; so called because originally intended, and for centuries used, for conveying the tribute rice and other grains to Peking. See GRAND CANAL.

Yunnan, yūn'naan' (literally, south of the clouds, in allusion to the great banks of clouds which hang over the highlands of Sze-chuen on the north): a southwestern province of China, bounded on the N. by the province of Sze-chuen, E. by Kwei-chow and Kwangsi, S. by Burma and the Laos, and W. by Burma; area, 107,969 sq. miles; population, 11,721,576. Capital, Yunnan-foo, situated on the north shore of Lake Chin, one of the two great lakes of the province (see map of China, ref. 7–F). It is described by Baron von Richthofen as consisting for the most part of an extensive plateau containing extensive valley-plains at altitudes of 5,000 to 6,000 feet, overtopped by ridges which separate them and rise to a nearly uniform level. In these valley-plains most of the great cities are situated. He also mentions some very elevated mountain ranges, situated in the northwest, whose snow-covered summits tower high up above the plateau. Yunnan is rich in minerals. Coal occurs on the borders of the plateau; gold is washed on many of the rivers; silver is also found, and has been worked to some extent; spelter is plentiful, and is extensively worked. Tin is extensively mined in the southeastern portion of the province, and iron is widely distributed. The most important, however, is copper, which is found in great abundance. Yunnan is the chief source of supply for the empire. Lead is also of frequent occurrence. Among the other products of the province are medicines and opium, and the famous Puh-wih tea, which is said by natives to be more refreshing than any other kind. R. L.

Yupanqui, yoo-păăn'kĕĕ, called **Ynpanqui Pachacu'ti**, or **Pachacutec Yupanqui**: the ninth and one of the greatest of the Inca sovereigns of Peru; second son of the Inca Viracocha; b. about 1380. It is related that Urco, his elder brother and heir to the throne, was incompetent and was either forced to resign or was killed at a critical moment, when Cuzco was threatened by the powerful Chanca tribe. Yupanqui assumed the government (about 1400), defeated the Chancas in a great battle, and annexed their territory. Subsequently he continued his conquests during a long reign, and at his death (about 1440) the Inca empire embraced nearly all of the territory now included in Peru. Yupanqui is a favorite hero of Quechua tradition, and many institutions are traced to him. H. H. S.

Yusuf-ben-Ayub-Salah-ed-Din: See SALAHDIN.

Yusuf-ben-Taxfyn': second prince of the Almoravide dynasty; b. at Velad Sahara in 1006; gained great military renown. Crossing to Spain as the ally of the Moorish king against Alphonso VI. of Castile, he powerfully contributed to the victory of Zalaca near Badajoz (1086). Dissensions arising among the Mussulmans, he gradually became master of the kingdoms of Malaga, Granada, Murcia, Cordova, Seville, Almeria, Badajoz, and Valencia. Though so powerful, he was content with the title of emir. His son Ali was acknowledged in 1103 as successor to both his Moorish and Spanish possessions. D. in 1106. E. A. G.

Yverdun, ĕĕ'văr'dŏn' (ancient *Eburodu'nun*): town; canton of Vaud, Switzerland; at the mouth of the Thiele, in Lake Neuchâtel; 20 miles by rail N. of Lausanne (see map of Switzerland, ref. 5–B). It was the seat of the celebrated institute of Pestalozzi (1805–25); has a library with Roman antiquities, a school for deaf mutes, and a gymnasium. Pop. (1888) 6,330.

Yves d'Évreux, ĕĕv'dev-rŏ', PIERRE: missionary and author; b. at Evreux, in Normandy, about 1577. He entered the Capuchin order in 1595, and was superior of the four missionaries sent with a French colony to Maranhão, Brazil, in 1612. He returned about 1614, and shortly after wrote an account of the mission intended as a continuation of the work of CLAUDE D'ABBEVILLE (*q. v.*). The printer who had charge of this was bribed, for political reasons, to destroy it; but some of the sheets, including all except the preface and a few chapters, were saved. From these a new edition was prepared in 1615, with the title *Svitte de l'histoire des choses plus memorables advenues en Maragnan es annees 1613 et 1614*. From the single known copy, in the Bibliothèque Nationale of Paris, a modern edition, with notes, was published by Ferdinand Denis in 1864. Yves d'Évreux was alive in 1620, but the date of his death is unknown. H. H. S.

Yvetot, ĕĕv'tō': town; department of Seine-Inférieure, France; 24 miles N. W. of Rouen by rail (see map of France, ref. 2–E). It manufactures cotton and linen fabrics, silk, and velvet, and trades in corn and wine. The lords of Yvetot were clothed with the title of king in the fifteenth and sixteenth centuries, and this has given rise to many humorous references in French literature, notably a song of Beranger. Pop. (1896) 7,545.

Yvon, ĕĕ'vŏn', ADOLPHE: historical and portrait painter; b. at Eschwiller, Moselle, France, Feb. 1, 1817; pupil of Paul Delaroche; received a first-class medal at the Salon of 1848, second-class medals at the Paris Expositions of 1855 and 1867, and a medal of honor at the Salon of 1857; became an officer of the Legion of Honor 1867; Professor of Drawing in the École des Beaux-Arts, Paris. In 1855 he was sent by the Government to the Crimea to paint pictures of the war. Six large battle pictures by him are in the Versailles Museum. WILLIAM A. COFFIN.

Y'ylang-Y'ylang: another spelling of IHLANG-IHLANG (*q. v.*).

Yzabal, or **Ysabal**: See IZABAL.

Z

: the twenty-sixth letter of the English alphabet.

Form.—It has the form of the final letter of the Roman alphabet, which was simply the Greek letter *zēta*, introduced at the same time as Y, late in the first century B. C., to aid in transliterating the numerous Greek loan-words and proper names which were establishing themselves in Latin usage. The older Latin alphabet of twenty-one letters had no symbol for the voiced sibilant *z*.

Name.—The English name, *zee* (phonet. *zī*), is a late invention adapted to the sound and following the analogy of *bee, cee, dee, gee, pee, tee.* An older name is *zed or i'zed*, often written *izzard*; cf. the proverb "from a to izzard." This represents O. Fr. *zède*, Lat. *zeta*, or an *et zède*—i. e. "and *z*"—which was pronounced *ézede*, and regularly became *ized* in English.

Sounds.—(1) The voiced dental sibilant *z* in *zone, zephyr, mazy.* The same sound is frequently expressed by *s*, as in *lose, nose, reason.* (2) The voiced dental wide sibilant *zh* (*ž*) in *azure, seizure*, a sound correlative to the voiceless *sh* (*š*) of *sugar, sure, censure.* The sound *zh* is frequently expressed also by *s*, as in *pleasure, leisure.*

Sources.—The chief sources of the sound *z*, whether denoted by *s* or *z*, are the following: (1) O. Eng. *s*, which became voiced to *z* when unaccented and in contact with voiced sounds. As Teutonic *z* had become *r* in O. Eng., *z* is not found there. English words beginning with *z* are therefore all foreign. Cf. *freeze* < O. Eng. *frēosan* : Germ. *frieren, frost*, Lat. *pruina*; *sneeze* < O. Eng. *snēosan*, akin to Germ. *niesen*; *choose* < O. Eng. *cēosan* : Germ. *kiesen*, Lat. *gustare*; *weasel* < O. Eng. *weslé* : Germ. *wiesel*; *wise* < O. Eng. *wīs* : Germ. *weise.* Illustrations of the contrast *s* : *z* are found in *grass* : *graze, brass* : *brazen, use* (noun) : *use* (verb) < M. Eng. *usen, house* (noun) : *house* (verb), *abuse* (noun) : *abuse* (verb); also in *cats, tacks, maps*, versus *lads, pigs, cabs.* As is seen in *use, abuse*, as well as in *reason, misery*, etc., the change *s* > *z* affects the French as well as the native element. (2) In loan-words from various sources: *zeal*, from Fr. *zèle*, from Gr. ζῆλος, *zodiac* (Fr.-Lat.-Gr.), *zenith* (Span.-Arab.) BENJ. IDE WHEELER.

Zaandam, zaăn-daam', or **Saardam**: town; province of North Holland, Netherlands; on the Zaan; 5 miles N. W. of Amsterdam by rail (see map of Holland and Belgium, ref. 4–E). It has numerous flour, oil, and saw mills, extensive paper manufactures, and a little ship-building. The house in which Peter the Great lived while he worked here as an artisan is still preserved. Pop. (1899) 21,164.

Zabism: See SABISM.

Zacatecas, thăă-kăă-tā'kăăs: an interior state of Mexico; bounded N. by Coahuila, E. by San Luis Potosí, S. by Jalisco, and Aguas Calientes, and W. by Jalisco and Durango. Area, 25,229 sq. miles. The western part, lying on the slope of the Sierra Madre, is mountainous; the eastern part is included in the plateau, with valleys southward which are below 3,000 feet, and therefore in the *tierra caliente*, or hot land. The climate is temperate on the plateau, but somewhat dry; in the northern part of the state large areas are arid and desert-like, but they are interspersed with tracts of excellent pasture, which support large herds of cattle and sheep. The southern districts are generally very fertile, and are especially fitted for the cultivation of cereals; this is one of the great maize-producing states. The mountain-lands are partly covered with oak and pine forests. In its silver mines Zacatecas stands pre-eminent among the Mexican states. It is estimated that the production since 1548 has exceeded $810,000,000, and though some of the older deposits have been worked out, others are discovered to take their places. A few veins yield a small percentage of gold. Copper, lead, quicksilver, etc., occur, and are mined on a considerable scale. Zacatecas was conquered from the Chichimec Indians about the middle of the sixteenth century, and its mines were famous almost from the first. Pop. (1893) estimated, 485,640. H. H. S.

Zacatecas: a city of Mexico; capital of the state of Zacatecas; in a high valley between spurs of the Sierra Madre; over 8,000 feet above sea-level; 439 miles by the Mexican Central Railroad N. W. of Mexico city (see map of Mexico, ref. 6–F). It was founded as a mining-town about 1548; its silver lodes were for some time the most famous in New Spain, but they are now surpassed by others in the state and elsewhere. About 15,000 miners and ore-workers are employed in the vicinity; reduction is generally by the *patio* process. The climate is cold and subject to sudden changes, though not insalubrious; the water-supply is scanty and poor, and the narrow valley leaves so little room for growth that many of the streets climb the mountain-sides like staircases. Carriages are almost unknown. The city, however, is very picturesque, resembling a Moorish town. It has a cathedral (commenced in 1612, completed in 1752) noted for its quaint carvings; the magnificent silver font for which it was formerly famous was confiscated under the Juarez law. On the Bufa hill near the city is a celebrated chapel and resort of pilgrims; and at Guadalupe, 6 miles distant, is one of the most beautiful chapels in Mexico, with a handsome park. Pop. of Zacatecas (1892) about 60,000. H. H. S.

Zach, tsăăkh, FRANZ, Baron, von: astronomer; b. at Presburg, Hungary, June 4, 1754. He was director of the observatory of Seeberg, near Gotha, 1787–1806; he published *Monatliche Correspondenz zur Beförderung der Erd- und Himmelskunde* (28 vols., Gotha, 1800–13), afterward continued in Italy under the title of *Correspondance astronomique*, which are, together, the most important astronomical periodicals before the *Astronomische Nachrichten.* D. in Paris, Sept. 2, 1832. He also wrote *Tabulæ Motuum Solis novæ et correctæ* (Gotha, 1792); *Supplementa ad Tabulas Motuum Solis* (Gotha, 1804); *L'Attraction des Montagnes et ses Effets sur les Fils à Plomb* (Avignon, 2 vols., 1814); and other works. Revised by SIMON NEWCOMB.

Zachari'as: pope 741–752. By his personal influence with several of the Lombard kings he obtained the restoration of certain cities and lands formerly subject to the Roman Church. He also prevented for a time the extinction of the exarchate by the Lombards. He sanctioned the deposition of Childeric III., the last of the Merovingians, and the consecration of Peppin in his place, thereby putting an end to the weak and incapable line which had outlived its usefulness. He continued to St. Boniface the direction and sympathy which his predecessors had given. He was very charitable, generous, and mild, "a man of great faith, courage, and self-reliance," a benefactor of the clergy, and a lover of letters. See art. *Zachary* in *Dictionary of Christian Biography.* J. J. KEANE.

Zacynthus: See ZANTE.

Zadkiel: the pseudonym of William Lilly, the astrologer (1602–81), and of one Richard James Morrison (b. 1794), who from 1830 until his death in 1874 published an astrological almanac, forecasting the weather and the principal events of the coming year.

Zadok: See SADDUCEES.

Zaffre, or **Zaffer**: See COBALT.

Zagazig, zaă-gaă-zeeg': town; in Lower Egypt. Connected with Alexandria, Cairo, Ismailia, and Suez by rail, it has become the entrepôt of Northwestern Egypt, and is rapidly growing. Near by are the ruins of ancient BUBASTIS (*q. v.*). Pop. (1897) 35,715. E. A. G.

Zagros Mountains: a range of mountains lying between ancient Media and Assyria.

Zaleszczyki, zaă-lesh-chik'ĕe: town; in Eastern Galicia, Austria; on the left bank of the Dniester, which at this point separates Galicia from the Bukovina (see map of Austria-Hungary, ref. 5–L). It is situated in a fertile plain, has a beautiful castle, a large sugar-factory, and considerable trade in grain and wood, carried on in several annual fairs. Pop. (1890) 3,750, mostly Ruthenians; the district has 73,598 inhabitants. H. S.

Zaleu'cus (in Gr. Ζάλευκος): the lawgiver of the Epizephyrian Locrians in Magna Græcia; flourished in the middle of the seventh century B. C. His code is said to have been the first collection of written laws which the Greeks ever possessed. Of his personal life and of his legislation nothing is known but loose tradition, but from this it would seem that his laws were severe. Adultery was punished by the loss of both eyes; the use of unmixed wine and journeys to foreign countries were forbidden; any one who wished to propose a new law or the abolishment of an old was compelled to step forward in the assembly with a rope around his neck, and if his proposition was rejected he was immediately strangled.

Zalin'ski, EDMUND LOUIS: soldier and artillerist; b. at Kurnik, province of Posen, Prussian Poland, Dec. 13, 1848; came to the U. S. as a child; was educated in the schools of Seneca Falls and Syracuse, N. Y., and on Feb. 23, 1865, was appointed second lieutenant Second New York Artillery. Mustered out Sept. 29, 1865; appointed second lieutenant in the Fifth U. S. Artillery Feb. 23, 1866, first lieutenant Jan. 1, 1867, and captain Dec. 9, 1887. He served in garrison with his company at various military posts, at the artillery school at Fort Monroe, and as Professor of Military Science and Tactics at the Massachusetts Institute of Technology. Retired from active service owing to disability Feb. 3, 1894, he accepted a position as foreign agent of the Bethlehem Iron Company. Author of *Ordnance Notes on Telescopic Sights for Cannon, Deflection of Projectiles by Wind*, and various articles on submarine warfare and the pneumatic torpedo-gun. He was so intimately connected with the construction and introduction of the latter weapon that it is popularly known as the "Zalinski dynamite-gun." JAMES MERCUR.

Zalus'ki, JÓSEF ANDRZEJ: bishop and scholar; b. in Poland, 1702. He was for three years ambassador to Rome to Pope Clement XII., and later became Bishop of Kiev. Being violently opposed to the Dissidents who enjoyed the protection of Russia and Prussia, he was, at the instance of the Russian ambassador Repnin, banished to Kaluga and confined there till 1773. D. Jan. 9, 1774. Zaluski's principal merit is his reawakening of Polish literature just at the period of the political downfall of Poland. Though a great scholar, he was not a great writer, but spent his entire fortune on the collection of a library of 230,000 volumes, which he bequeathed to the Polish nation. After the third partition of Poland, however, it was transferred to St. Petersburg, where it became the nucleus of the great Imperial Public Library. Zaluski's *Biblioteka historyków*, written at Kaluga from memory (ed. Muczkowski, Cracow, 1832), and *Specimen historiæ Poloniæ criticæ* (Dantzic, 1733) are of considerable bibliographical and historical value. H. S.

Zama, zā'maă: town of Numidia, near the Carthaginian frontier; was very strong in the time of the Punic wars, and selected by King Juba as his residence and the depository of his treasures. Here was fought, in 202 B. C., the famous battle in which Publius Cornelius Scipio defeated Hannibal, thereby bringing the second Punic war to an end. Revised by G. L. HENDRICKSON.

Zamacois, Span. pron. thaă-maă-kō'ees, EDUARDO: genre-painter; b. at Bilbao, Spain, in 1842; pupil of Federico de Madrazo in Madrid and of Meissonier in Paris; medals at the Paris Exposition 1867 and Munich 1870. D. in Madrid, Jan. 14, 1871. His pictures are among the best of their kind in modern art, characterized by excellent drawing, felicity of expression, and good color. *The Education of a Prince* (1870) is one of his most celebrated works, and *The King's Favorite* (1867), is a fine example. W. A. C.

Zambesi, zăm-bee'zĕe: the fourth river in size in Africa. Its most western head waters rise a little E. of Benguela, Portuguese West Africa, and the Zambesi proper flows S. and E. two-thirds of the way across the continent, emptying into the Indian Ocean by a widespreading delta, in about 18° 30′ S. lat. The country it drains is one-fifth as large as the U. S. exclusive of Alaska. From its sources nearly to its mouth it passes through one of the largest pastoral regions of Africa. It was long supposed that the Zambesi could not be made available for commerce from the sea because no channel of its delta was known through which ocean steamers might meet river craft. In 1889, however, Mr. Rankin brought to notice the Chinde branch of the delta, through which, he had discovered, navigable communication with the sea might be attained. This discovery at once stimulated enterprise on the river. Steamboats are superseding the small trading canoes formerly in use, and the town of Chinde has been built in the delta as the port of the river. Above the delta there are 600 miles of steam navigation on the Zambesi and its northern tributary, the Loangwa, interrupted by one stretch of 30 miles of land portage around cataracts. Coal has been discovered near the north bank of the middle Zambesi, and promising gold-fields N. of the river and within easy reach of it. On the upper Zambesi are the famous VICTORIA FALLS (*q. v.*). The total length of the river is between 1,500 and 1,600 miles. C. C. ADAMS.

Za'mia [Mod. Lat., from Lat. *za'mia* = Gr. ζαμία, ζημία, hurt, damage, loss]: a genus of cycadaceous plants, partly treelike and partly stemless. The genus has a wide geographical range. *Z. integrifolia*, the COONTIE (*q. v.*) of Florida, *Z. tenuis* and *Z. furfuraceæ* of the Bahamas, *Z. cycadis* of South Africa, *Z. pumila* in the West Indies, and other species furnish starchy food from their stems, and known in commerce as arrowroot and sago, though in strictness it is neither. Revised by C. E. BESSEY.

Zamojski, zaă-moi'skĕe: a famous Polish family of old nobility and great wealth. The Austrian branch was raised to the rank of Austrian imperial counts by Leopold II. in 1791.—JAN ZAMOJSKI, b. Apr. 1, 1541, at Skoków, palatinate of Chelm. In the diets after the death of King Sigismund Augustus in 1572 he brought about an extension of the elective franchises of the nobles, so that every one who served personally in the army, with his own equipment and at his own expense, was also entitled to participate in the election of the king. He was especially instrumental in the election of Henry of Anjou (later King Henry III. of France), and when Henry left Poland, after a few months, succeeded in establishing Stephen Bathori, Prince of Transylvania, on the throne in 1576. Between this excellent king and the king-maker there existed perfect harmony, and Zamojski was made commander-in-chief of the Polish army and grand chancellor of the Polish crown, and in 1583 married the king's niece, Griseldis. On the death of Bathori (1586) Zamojski secured the throne to Sigismund III., and defeated the party of Prince Maximilian of Austria at Pitschen (Upper Silesia); but owing to Sigismund's weakness and suspicion he was soon superseded by incompetent favorites. D. June 3, 1605, at ZAMOSC (*q. v.*). He wrote *De Senatu Romano* (Venice, 1563); *Testamentum Joannis Zamori* (Mentz, 1606), etc. His biography was written by Zurkowski (Lemberg, 1860).—ANDRZEJ ZAMOJSKI, b. in 1716 at Zdiezun, government of Płock; entered the Saxon military service; returned to Poland in 1754 as major-general; became a senator, commander-in-chief, and finally, in 1764, grand chancellor. But in 1765 Zamojski resigned his offices and retired to his estates. Here he introduced many reforms, and even abolished serfdom, which raised a bitter enmity against him among other noblemen. On the invitation of the diet of 1776 he drew up a code of law, comprising an elaborate regulation of the rights and duties of the third estate, *Zbór praw sądowych* (3 vols., Warsaw, 1778); this, though rejected by the diet of 1780, was adopted by the constitution of May 3, 1791. D. at Zamosc, Feb. 10, 1792. Revised by HERMANN SCHOENFELD.

Zamo'ra: an interior state in the western part of Venezuela; surrounded by Lara, Carabobo, Miranda, Bolivar, and Los Andes (or Zulia). Owing to the frequent changes in this and other Venezuelan states, it is impossible to compute the area with accuracy; in 1892 it was estimated at 25,212 sq. miles, with a population of 249,018. The northwestern part is included in the Venezuelan Andes, the remainder is a plain, part of the *llanos* district, but interspersed with patches of forest and watered by numerous streams; these flow to the Apure on the southern boundary, and through it to the Orinoco. The only important industries are agriculture in the mountain districts, where the famous Barinas tobacco is raised, and stock-raising on the plains. Owing to lack of communications the development of the state has been slow. Capital and largest town, Guanare. H. H. S.

Zamora: capital of the province of Zamora, Spain; 182 miles N. W. of Madrid; on the Douro, which here is crossed by a splendid bridge (see map of Spain, ref. 14–D). It contains a Romanesque cathedral completed about 1174, many fine churches, palaces, monasteries, hospitals, barracks, and other public buildings; but these edifices, like the dilapidated walls which surround the city, are now only monuments of a

splendor long gone by. Its manufactures of serges, linens, leather, hats, brandy, and liqueurs are not important, but its trade in wine and grain is brisk. Pop. (1887) 15,292.

Revised by M. W. HARRINGTON.

Zamosc, zaa'mōsts (Russ. *Samostje*): district town and fortress in Poland, government of Lublin; 154 miles S. E. of Warsaw, on the Wieprz (see map of Russia, ref. 8–B); founded by Jan Zamojski, after his victory over Archduke Maximilian of Austria in 1588. He established here a high-grade academy with a valuable library, which flourished for over two centuries, until it was suppressed by the Russians. The city remained in the possession of the family of Zamojski until 1820, when it was bought by the Russian Government. Pop. 9,235 (5,720 Jews); of the district (1890) 100,972, including 12,320 Jews. Revised by H. SCHOENFELD.

Zamouse: See NIARE.

Zampieri: See DOMENICHINO.

Zancle: See MESSANA.

Zane, EBENEZER: pioneer; b. in Berkeley co., Va., Oct. 7, 1747; was of Danish descent; settled on the present site of Wheeling 1770, making the first permanent establishment on the Ohio river; built there a blockhouse called Fort Henry, from which he repulsed several assaults made by the Indians during the Revolution; was a disbursing officer under Lord Dunmore; held several other civil and military posts, gaining the rank of colonel, and became owner of the land on which the city of Zanesville, O., now stands. D. at Wheeling in 1811.

Zanel'la, GIACOMO: poet; b. at Chiampo (district of Vicenza), Italy, in 1820. After studying for the priesthood at the seminary of Vicenza he became Professor of Philosophy and Italian Literature in the same institution. In 1855 he was given a similar position in the lyceum of Santa Caterina (now Marco Foscarini) at Venice. In 1856 he became director of the gymnasial lyceum at Vicenza; in 1862 director of the similar institution at Padua. In 1866 he was appointed Professor of Italian Literature in the University of Padua, and in 1871–72 rector of the university. He was obliged by failing health to retire from active service in 1872. He had in the latter part of his life obtained great fame as a lyric poet. Distinguished for beauty of style and mastery of form, he held a peculiar position among Italian poets through attempting to show a moral and religious meaning in both the scientific and the patriotic movements of his time. D. at Vicenza, May 17, 1888. His noted poem *La conchiglia fossile*, as well as others in the same vein—*Scienza e natura*, *L'industria*, *Il lavoro*—were among the first efforts within the Church in Italy to reconcile the new with the old order of things. His first volume of poems, *Versi*, appeared in 1868. This has been followed by *Poesie* (1877) and *Nuove poesie* (1878), as well as by the poetic tales *Il piccolo Calabrese* (1870); *Il pettirosso* (1881); *L'Astichello* (1881); and *Edvige: racconto* (1881). In prose he published *Scritti vari* (1877); *Parallele letterarie* (1884); and *Della letteratura italiana nell' ultimo secolo* (1885). We may mention also various contributions to the *Atti dell' Istituto Veneto* and other learned journals.

A. R. MARSH.

Zanesville: city; capital of Muskingum co., O.; on the Muskingum river at the point where it receives the waters of the Licking, and on the Balt. and O., the Bellaire, Zanesville and Cincinnati, the Cin. and Musk. Val., the Cleveland, Akron and Columbus, the Wheeling and Lake Erie, the Col., Sandusky and Hocking, and the Ohio and Little Kanawha railways; 78 miles from Marietta, where the Muskingum joins the Ohio river; 59 miles E. of Columbus, the State capital, and 137 miles S. by W. of Cleveland (for location, see map of Ohio, ref. 5–G). It is in a fertile agricultural country, on the edge of the great mineral region of Ohio, abounding in bituminous coal, limestone, potters' clay, and to some extent in iron ore, and possesses splendid water-power for manufacturing from the falls of the two rivers. The Muskingum is here crossed by four iron bridges and by two others, two of the former being railway bridges, and the Licking is spanned by three bridges, one of which is a railway bridge. The city is laid out regularly with wide streets, and the principal ones are paved with the paving-brick made here. Surrounded as the city is with high hills, there is very little room for parks. The two most worthy of mention are the Putnam and the McIntire. There are gas and electric-light plants, water-works, and an electric street-railway. The notable buildings include the court-house, faced with limestone quarried in the neighborhood; the Soldiers' and Sailors' Memorial Hall, the Masonic and Odd Fellows' Halls, City Prison, Market-house, Work-house, and Opera-house.

Business Interests.—Zanesville early became a manufacturing and commercial point of considerable importance, and maintained a large export trade in flour, provisions, etc., to New Orleans and other markets in the Southwest until superseded by greater rivals in the new Northwest. In President Jackson's administration, about 1833, the National Road from Cumberland, Ind., was completed to Zanesville, and for twenty years, until the completion in 1853 of the Central Ohio Railroad, was the great highway from Baltimore and Washington to the "West." The manufacturing interests are numerous and varied, and include iron-works, 2 tiling-works (encaustic and mosaic), 6 large potteries, 2 foundry and machine shops, 4 glass-works, 5 pressed, paving, and common brick works, 4 planing-mills, 2 flouring-mills, 3 breweries, 2 tanneries, 1 woolen and 1 cotton mill, 3 marble-works, 2 furniture-factories, 2 stove-foundries, 1 coffin and casket factory, canning-works, ice-factory, soap-factory, bent-wood factory, and a tobacco-factory, and the large car-shops of the Baltimore and Ohio Railroad Company. These give employment to 5,000 persons.

Finance and Banking.—In 1894 the municipal receipts aggregated $130,000; the total debt (including $380,000 in water bonds) was $681,554; and the assessed property valuation was $8,893,808. There were 3 national banks with combined capital of $550,000 and surplus of $167,000, an independent bank, and 7 building and savings organizations.

Churches and Schools.—The churches comprise 6 Methodist, 4 Baptist, 4 Presbyterian, 2 Roman Catholic, 2 Lutheran, and 1 each Disciples, Congregational, Protestant Episcopal, Evangelical German, Hebrew, United Brethren, and Universalist. There are 17 public-school buildings, a high school, an academy for boys, Putnam Female Seminary, 2 Roman Catholic parochial schools, a Lutheran parochial school, and a Hebrew school. In 1900 there was a public-school enrollment of 3,800, and the cost of the system for the year was $60,000. The library of the Zanesville Athenæum (8,000 vols.), founded in 1827, is free to high-school pupils. In 1901 there were 3 daily, a semi-weekly, and 6 weekly newspapers.

History.—The original town was laid out in 1799 by Jonathan Zane and John McIntire, Virginians. They owned a section a mile square, and platted the lots in the southeast corner and called it Westbourn, a small part of the present city. The first regular mail carried in Ohio was from Marietta to Westbourn. In 1802 Postmaster-General Gideon Granger established a regular post-office here and called it Zanesville, whence the town took its name, but it was not incorporated until 1814. From 1810 to 1812 Zanesville was the State capital. Pop. (1900) 23,543. R. B. BROWN.

Zanguebar: See ZANZIBAR.

Zante, zăn'te [Lat. *Zacyn'thus* = Gr. Ζάκυνθος): island; one of the largest of the Ionian group. Area, 277 sq. miles. It is of volcanic origin and earthquakes are frequent. The climate is delightful and the soil very fertile. The island produces currants, citrons, oranges, pomegranates, melons, olives, and wine, all of superior quality; carpets, linen and cotton goods, and gold ornaments are manufactured. In the village of Kery are naphtha wells, constantly worked since remote antiquity. Zante, the capital, is a finely situated and enterprising town, well provided with schools, churches, and public buildings. It has a good, though not deep, harbor protected by a mole, and carries on a large trade. Pop. (1889) of island, 44,070; of capital, 16,603.

EDWIN A. GROSVENOR.

Zanzibar', or **Zanguebar**: a sultanate of East Africa under British protection. It formerly consisted of coast islands and possessions on the mainland that were acquired by Imams of Muscat from the Portuguese and from native chiefs between 1698 and 1807. The long strip of coast extending for 3 degrees of latitude N. of the equator and nearly 11 S. of it, together with the adjacent islands, has been the field of enterprise of Arabs from Muscat for three centuries. Here they planted their colonies, extended trade, established Islam, and gradually pushed their influence into the interior until their ivory and slave traders were found all through the region of the great lakes and over a wide area of the upper Congo. The Sultans of Zanzibar, direct descendants of the Imams of Muscat, were until recently the paramount influence from the coast to the upper Congo. Zanzibar has been independent of Muscat since 1861.

The largest island and center of trade of the sultanate is Zanzibar (area, 625 sq. miles). Other important islands are Pemba, Mafia, and Lamu, the total extent of the islands pertaining to the sultanate being about 1,200 sq. miles. Until 1890 about 12,000 sq. miles of coast regions were under the direct government of the sultan, though in 1884–90 the Germans and British acquired inland territories extending to the large lakes among numerous tribes who had not actually come under the sultan's authority. The sultan at first leased to these two powers a long coast strip, but later they acquired this territory in perpetuity, and finally Great Britain assumed a protectorate over Zanzibar (1890), and the independent state created by the Muscat Arabs has ceased to exist.

The island of Zanzibar has a population of about 150,000, of whom about 80,000 live at the capital, including 10,000 Arabs and 5,000 East Indians, the remainder being an admixture of coast and inland tribes, whose language, ki-Suaheli, embraces, like their blood, many different elements, and is the *lingua franca* over a large part of equatorial Africa. The Arabs, who are the ruling element throughout the sultanate, are almost exclusively tradespeople, except W. of Lake Tanganyika, where they made large plantations. They established large interior towns—Tabora, Ujiji, Nyangwe, Kassongo, and others—and often remain for a long time or permanently in the interior. The capital for their enterprises is largely supplied by the Indian merchants of Zanzibar and the coast towns, who receive an exorbitant rate of interest and usually contrive to keep the Arabs deeply in their debt.

The capital city, Zanzibar, is by far the largest center of trade in East Africa, and has been the starting-point of many of the most famous exploring expeditions. It was once the greatest slave-market, and is still the largest export ivory-market in the world. Most of the interior trade routes lead to Zanzibar or to a half dozen coast towns, N. and S., that are directly tributary to it and send their exports there for shipment. In 1899 the imports were valued at $7,769,085, and the exports at $7,364,238. The city was declared a free port in 1892. It is visited by about three merchant steamships a week. Pemba is famous for the production of cloves. The most important coast towns are Mombasa (pop. 12,000), now in the British domain, and Kilwa (10,000), Bagamoyo (10,000), Pangani, Saadani, Dar es Salaam, Lindi, Tanga, and Malindi, all in German East Africa. See GERMAN EAST AFRICA and IBEA. C. C. ADAMS.

Zapolya, zaă-pol'yăa: the name of a powerful Hungarian family of Slavonian origin which at one time maintained a protracted contest with the house of Hapsburg for the possession of the Hungarian crown. Stephen Zapolya, wojwode of Transylvania, one of the generals of King Mathias Corvinus of Hungary, took a prominent part in the conquest of Austria and afterwards became its governor. After the king's death in 1490 he brought about the election of Wladislaw II. of the Jagellon family, but died in Jan., 1499, while preparing a great war against the Turks.—His son JOHANN ZAPOLYA, b. in 1487, was proclaimed King of Hungary in 1527 by one section of the nobles, while the other elected Ferdinand of Austria, against whom Zapolya maintained himself with the aid of the Turks in Transylvania and in Hungary beyond the Theiss. He died at Mühlenbach, July 22, 1540.—His son JOHANN ZAPOLYA II. (1540–71) introduced into Transylvania the Reformation, which was recognized in the Transylvanian diet by a state law as early as 1555. With the death of Johann II. the male line of the family of Zapolya became extinct. His daughter, Barbara Zapolya, became the wife of King Sigismund I. of Poland. HERMANN SCHOENFELD.

Zapotecs, tsaă-pō-teks', **Tzapotecs**, or **Zapote'cos**: an important race of Indians in Southern Mexico. Before the Spanish conquest they were a powerful nation, occupying a region corresponding nearly to the modern state of Oaxaca, with portions of Guerrero. They resisted the Aztecs successfully, and only submitted to the Spaniards after several bloody campaigns 1522–27; two subsequent revolts were put down and they eventually gave up the struggle in 1551. The Zapotecs were entirely distinct from the Aztecs by their language, but resembled them in many of their customs and in their method of computing numbers, calendar, etc. They were considerably advanced in civilization, building large towns of stone and mortar, using a cotton armor in warfare, and excelling in agriculture and many textile arts. Their religious system was elaborate, and they offered human sacrifices to their idols. The ancient ruins of Mitla, etc., were supposed by them to be the tombs of their ancestors. The Zapotecs still constitute a large part of the country population of Oaxaca, numbering about 260,000, or with the allied Mixtecs, etc. (Zapotec-Mixtec stock) nearly 700,000. Many of them speak only their own language and retain some of their ancient customs, but they are devout Roman Catholics, submissive to the whites, and excellent citizens. Some of them have attained wealth and positions of trust. A notable example was the Mexican reformer and president Juarez, who was a pure-blooded Zapotec. H. H. S.

Zara, zaa'răă (Slav. *Zadar*): capital of the Austrian province of Dalmatia; on a narrow promontory jutting into the Adriatic; 130 miles S. E. of Trieste (see map of Austria-Hungary, ref. 10–E). It has a fine harbor and active commerce. In 1890 1,448 ships entered the harbor, with a tonnage of 376,674. It manufactures fine linen and silk, and the celebrated *maraschino* liquor of Zara from a peculiar bitter cherry, growing especially in the fields of Makarska, near Spalato. It is the seat of a Catholic archbishop and Greek bishop, and has a large college. The ancient cathedral in Roman-Lombard style, the San Donato church, and the *Porta di Terraferma*, are the most remarkable monuments. Pop. 14,500 (commune, 49,710). H. S.

Zárate, thaar'ăa-tā, AGUSTIN, de: historian; b. in Spain about 1492. He was comptroller of Castile for fifteen years, and in 1543 went to Peru with the viceroy Blasco Nuñez Vela with a special commission to examine the colonial finances. He witnessed many events of the civil wars, made a special study of the country and its history, and returned to Spain after the fall of Gonzalo Pizarro. In 1555 he published his *Historia del descubrimiento y conquista de la provincia del Perú*. This is one of the most valuable of the early works on Peruvian history, though somewhat biased and in parts inaccurate. There are many later editions in several languages. Zárate died about 1560. H. H. S.

Zarathushtra: See ZOROASTER.

Zarncke, tsaărn'ke, FRIEDRICH: literary historian and philologist; b. in Zahrenstorf, near Brüel, in Mecklenburg-Schwerin, July 7, 1825. In 1848–50 he catalogued the famous Meusebach library at Alt-Geltow, near Potsdam, which was afterward purchased by the Prussian Government. In this work he attained a wide knowledge of mediæval literature. In 1850 he removed to Leipzig, where he established the *Litterarisches Centralblatt für Deutschland*, a weekly critical journal, which he edited until his death there Oct. 15, 1891. He was successively docent (1852), professor extraordinary (1853), and ordinary professor (1858). His great works were his edition of Brant's *Narrenschiff* (1854) and joint-editorship of Benecke's Middle High German lexicon (1863). Of his two great collections, his library became the property of Cornell University, Ithaca, N. Y., while his collections to illustrate Goethe's life and writings, the most extensive ever made, became the property of the city of Leipzig.

Zauschne'ria [Mod. Lat., named from M. Zauschner, a Bohemian botanist]: a perennial of the evening primrose family, with stem from 1 to 2 feet high and brilliant-colored flowers strongly resembling those of the fuchsia. It is a native of California. It blooms late in the summer and during the autumn, succeeds best in dry and sandy soil, and in the northern U. S. must be protected during winter.

Zavala, thaa-vaa'lăă, JOAQUIN: general and politician; b. in Nicaragua about 1839. He was a prominent army officer; was elected president of Nicaragua in 1879, and held the position during a peaceful and prosperous term until 1883. Subsequently he was minister to Washington. He led the revolt by which Sacaza was deposed in May, 1893; was declared provisional president July 17, but was deposed by another revolution within two weeks. H. H. S.

Ze'a (or *Zia*, Gr. Κέως, Lat. *Ce'a*, *Ci'a*): island in the Ægean Sea; one of the Cyclades; 12 miles E. from Cape Sunium. It is healthful, fertile, and well cultivated, producing cotton, wine, and figs. Pop. (1889) 3,863. E. A. G.

Zea, thā'ăă, FRANCISCO ANTONIO: naturalist and statesman; b. at Medellin, New Granada (Colombia), Oct. 21, 1770. He studied at the College of Popayan, and subsequently was associated with Mutis in botanical explorations. In 1795 he was arrested and sent to Spain on a charge of circulating republican pamphlets; he was acquitted in 1799, but forbidden to return to New Granada. For many years he continued his botanical studies in Europe; but his republican principles were unshaken, and eventually, in 1815,

he joined Bolivar in Jamaica, passing with him to Venezuela. The congress of Angostura (1819) elected him vice-president of Colombia, but in the succeeding year he went to Europe as special envoy of the republic to England and France. D. at Bath, England, Nov. 28, 1822. Zea has been called, not inaptly, the "Franklin of Colombia." Besides various scientific papers, he published a *Historia de Colombia* (1821). H. H. S.

Zealand: Dutch province. (See ZEELAND.) Also a Danish island (Själland). See SEELAND.

Zealots [from Gr. ζηλώτης, deriv. of ζῆλος, zeal; cf. ζεῖν, boil]: a fanatical Jewish sect which struggled desperately against the Romans from about 6 A. D., when Judas the Gaulonite headed a revolt, till the fall of Jerusalem, in the year 70. Beginning as intense Jews, they became robbers and murderers of their political opponents, and after Felix had cruelly endeavored to suppress them by crucifying all he could catch of them they armed themselves with short daggers (*sicæ*) and continued their murderous work on a larger scale. Hence they are known as the Sicarii. They kept alive the hatred of the Romans, which flamed out in the Jewish war, and they contributed much to the horrors of the siege of Jerusalem. Their literary memorial is the *Assumptio Mosis*. See Josephus, *War*, iv., and Schürer, *Jewish People*, *passim*.

Zeballos, thā-baal'yōs, PEDRO, de (often written *Ceballos*; in full, *Zeballos Cortés y Calderón*): general and administrator; b. at Cadiz, Spain, June 29, 1715. He entered the army as captain of cavalry in 1738, distinguished himself in Italy and elsewhere, and became lieutenant-general in 1755. In 1766 he was sent to the Rio de la Plata as governor of Buenos Ayres, taking out a considerable re-enforcement of troops. War having broken out with Portugal and England in 1762, Zeballos laid siege to the Portuguese post of Colonia de Sacramento, near the mouth of the Uruguay, forcing its surrender Nov. 2, 1762; twenty-six English ships were captured in the harbor. Zeballos was relieved in Aug., 1766, and returned to Spain. In 1776 he was appointed viceroy of the newly created viceroyalty of La Plata. On his way out he took Santa Catharina from the Portuguese (Feb., 1777), and retook and destroyed Colonia de Sacramento, which had reverted to Portugal. He governed wisely until relieved in 1778. D. at Cordova, Spain, Dec. 26, 1778. HERBERT H. SMITH.

Zebid (*Sabea Regia* of Ptolemy): town in Yemen, Arabia; on the Zebid; 60 miles N. of Mocha. It is the seat of a Sunnite college, and manufactures colored cotton fabrics. In consequence of inundations and of the obstruction of its harbor by silt, its prosperity and trade have greatly diminished. Pop. about 5,000. E. A. G.

Zebo'im [from Heb. *Tsᵉbō'īm*; cf. *tsᵉbā'īm*, gazelles, and *tsᵉbō'īm*, hyænas]: (1) one of the five "cities of the plain" (Gen. x. 19, xiv. 2; Hosea xi. 8)—Sodom, Gomorrah, Zoar, Admah, and Zeboim—all of which, except Zoar (See ZOAR), were destroyed (Gen. xix. 28, 29; Deut. xxix. 23). (2) A place of unknown locality. The name is differently spelled from (1). It is mentioned only in Neh. xi. 34. (3) A valley in Benjamin near Gibeah (1 Sam. xiii. 18), perhaps identical with the "valley of the hyænas" near Jericho. S. M. J.

Zebra [= Portug. *zebra*, from African name]: any one of the striped wild asses of Africa, but more particularly the mountain or true zebra (*Equus zebra*), a species found in the mountainous regions of South Africa, and in danger of extermination. It is about 4 feet high at the shoulders, of a creamy white color, cross-striped with black on the head, trunk, and legs, except on the belly and inside of thighs; the tail is tufted and blackish at the end. A closely related species (*E. grevyi*) occurs in Northeast Africa. Burchell's zebra (*E. burchelli*) is a commoner animal, occupying the central regions of Africa, readily distinguished from the true zebra by its larger size and the absence or faintness of the cross stripes on the lower part of the legs. It is known as DAUW (*q. v.*) by the Dutch colonists. The quagga (*E. quagga*) has no bands on the hinder portion of the body nor on the legs. The name *quagga* is also employed for Burchell's zebra. Although so conspicuously marked, the zebra is said to readily escape detection when lying down, as the stripes of the legs then blend with those of the body, the general effect being that of flecks of shadow on a light ground. Zebras are very wild and untamable, although occasionally broken to harness. F. A. LUCAS.

Zebra Wolf: See TASMANIAN WOLF.

Zebra-wood: a beautiful striped wood; used for veneering; is produced in Guiana by *Connarus guianensis* (or *Omphalobium lambertii*), a large tree of the family *Connaraceæ*, and in the West Indies by *Eugenia fragrans* of the family *Myrtaceæ*. L. H. B.

Zebu: book-name for the common domesticated ox of India, found also in China and East Africa, the name not being used in India. It differs from the common ox of Europe and America in having one, or more rarely two, humps of fat on the shoulders, and in having 18 caudal vertebræ, while our cattle have 21. The Brahman cow goes with young 300 days, the common cow 270. Hence the zebu is assigned to another species, *Bos indicus*. Nevertheless it breeds freely with the common cattle. The zebu is of several breeds, varying much in size. The beef is of fair quality, and the hump is prized. Zebus are trained to draw carriages, to plow, and to serve as beasts of burden. To this stock belong the Brahminy or sacred bulls of Shiva. Revised by F. A. LUCAS.

Zebú, or **Cebú**, Span. pron. thā-boo': one of the Visaya group of the Philippine islands; in the Malay Archipelago, E. of Negros; in lat. 9° 20′ N., lon. 113° E., and forms, together with the islands of Matan and Bohol, a province with about 430,000 inhabitants. The capital, Zebú, is a large and well-built town, with 34,000 inhabitants, a fine cathedral, a handsome episcopal palace, and a good trade in the products of the islands. It is an open port.

Zeb'ulon [from Heb. *Zebulūn*, *Zᵉbūlun*, *Zᵉbūlūn*, liter., habitation, deriv. of *zᵉbŭl*, habitation]: the tenth of the twelve sons of Jacob, the sixth and last by Leah. His personal history is a blank. In the exodus from Egypt the tribe of Zebulon marched in the van, next after Judah and Issachar, just ahead of the six wagons which carried the hangings, planks, and pillars of the tabernacle. The territory of the tribe in Palestine was bounded on the E. by the southern half of the Lake of Galilee, beginning just above the site of Tiberias, and included Nazareth and Rimmon, but especially the very fertile plain of *Buttauf* (10 miles from E. to W. and 5 from N. to S.), on whose northern edge, according to Robinson, stood Cana of Galilee (Josh. xix. 10–16). It disobeyed the divine command, and did not drive the Philistines from its territory, but brought them under tribute (Jud. i. 30). It answered the rallying-cry of Gideon (Judges vi. 35), and joined in the crowning of King David (1 Chron. xii. 33, 40). It ceased to exist as a tribe when Tiglath-Pileser carried the principal people of it into captivity (2 Kings xv. 29). But in its territory Jesus preached the most of the time (Matt. iv. 12–16), fulfilling Isa. ix. 1, 2.

Zech, FREDERICK: See the Appendix.

Zechari'ah [from Heb. *Zᵉkharyāh*, liter., whom Jehovah remembers]: the eleventh in order of the twelve minor prophets in the Old Testament. In its text the book is formally divided into five discourses. The first (i. 1–6) is dated the eighth month of B. C. 520 (ver. 1). The second (i. 7–vi. 15) is an account of a series of eight visions seen the twenty-fourth day of the eleventh month of the same year (i. 7)—that is, the latter part of Feb., B. C. 519. The third discourse (vii.–viii.) is dated two years later, the fourth day of the ninth month, and is perhaps a summary of several prophecies. There is, of course, no doubt that these three discourses belong to the time when Zerubbabel and Jeshua were building the second temple. The fourth discourse (ix.–xi.) is not formally dated, but is entitled The Burden of the Word of Jehovah in the Land of Hadrach. The fifth is without date, entitled The Burden of the Word of Jehovah upon Israel (xii.–xiv.). The fourth and fifth discourses differ linguistically from the first three. They present a situation in which Northern Israel is yet in existence, separate from Judah, as a political power, and in which Assyria is the great national enemy (ix. 10, 13, x. 6, 7, 10–11, xi. 14, etc.). The details of the fourth discourse fit a time in the later years of Uzziah (2 Kings xv. 17, *seq.*), and those of the fifth discourse fit the time after the death of Uzziah and just before the accession of Ahaz (2 Kings xv. 37; Zech. xiv. 5, etc.).

On this showing the opinions of scholars are divided. Many insist upon the unity of the book, whether they can reasonably account for the differences or not. Others regard the last two discourses as some generations later than the first three, and consider the allusions to Ephraim and Assyria as allegorical. Far more simple and probable, however, is the theory that the fourth and fifth discourses are genuine earlier prophecies (perhaps by the Zechariah of

2 Chron. xxvi. 5 or of 2 Chron. xxix. 13 [cf. Isa. viii. 2], or by the two), which have been appended to the book of the prophecies of the post-exilian Zechariah. The witness named in Isa. viii. 2 was the son of Jeberechiah, and the prophet named in Zech. i. 1 was the son of Berechiah, a mere variant of the other.

As to the personal history of the post-exilian prophet Zechariah, we only know that he was active, along with his colleague Haggai, in encouraging the leaders of the Jews in the work of temple-building (Ezra v. 1, vi. 14). Perhaps we should infer from Matt. xxiii. 35, Luke xi. 51 that he met later a tragic death at the hands of the people to whom he prophesied, though many think this reference to be to the earlier prophet of the days of Joash of Judah (2 Chron. xxiv. 20–22). That he was a priest is to be inferred from Neh. xii. 16.

It is probable that there existed, early in the Christian era, copies of the major and minor prophets, bound up together, some of them having Jeremiah for the first book in the volume and some having Isaiah for the first; and that it was a frequent thing to call the whole volume by the name of the book that was placed first. This affords the best explanation of the fact that Zech. xi. 12–13 is quoted as from Jeremiah in Matt. xxvii. 9–10. This is altogether parallel with the citing of a passage from Malachi as from Isaiah (Mark i. 2, Rev. Ver.).

Of commentaries on Zechariah, one of the fullest is that by Charles H. H. Wright, *Zechariah and his Prophecies* (1879). See also that by the Ven. T. T. Perowne, D. D., in the *Cambridge Bible for Schools.* W. J. BEECHER.

Zedekiah: See JEWS (*Kingdom of Judah*).

Zedoary [: Fr. *zédoaire* : Ital. *zedoairia*, from Arab. *zedwār*]: the warm aromatic root (rhizome) of certain East Indian plants of the family *Zingiberaceæ*. The long zedoary is from *Curcuma zerumbet*. Round zedoary is from *Curcuma zedoaria* and *Kæmferia rotunda*. Zedoary, like cassimuniar, galangale, and zerumbet, considerably resembles ginger, but the latter is so much superior to them all as to have crowded them entirely out of general commerce.
Revised by L. H. BAILEY.

Zee'land, or **Zealand**: province of the Netherlands; bounded S. by Belgium and W. by the North Sea; consists of the islands of Walcheren, Beveland, Tholen, Duiveland, and Schouwen; between the mouths of the Maas and the Scheldt. Area, 690 sq. miles. The ground is very low, and must be protected against inundation by dikes, but the soil is very fertile. Large crops of wheat, oats, potatoes, beans, madder, and tobacco are raised, and cattle, sheep, and pigs are extensively reared. The fisheries are valuable and the manufacturing industry is considerable. Pop. (1899) 216,-293. Middleburg is the capital. The other important towns are Flushing, Zierikzee, and Goes.

Zeeman Effect: See the Appendix.

Zeilah, zā'lăă: an African port on the southwest side of the Gulf of Aden (Somali coast); ceded to Egypt by Turkey in 1875 (see map of Africa, ref. 4–H). Since 1890 the whole north coast of Somali Land has been under British protection, and the two ports of Zeilah and Berbera are now held by the British, and are of much importance as gateways for the growing commerce of Northern Somali Land, a considerable part of which is fertile and populous. Though Zeilah is inferior to Berbera in position and advantages, it has greatly improved since the advent of the British made trade safe in the surrounding region. Pop. about 16,000.
Revised by C. C. ADAMS.

Zeisberger, tsīs'bĕrg-er, DAVID: Moravian missionary; b. at Zauchtenthal, Moravia, Apr. 11, 1721; in 1740 emigrated to Georgia. After studying Indian languages at Bethlehem, Pa., he began in 1743 his missionary work among the Indians, which he continued with unabated energy for more than sixty years. In 1771 he established a mission on the Muskingum river in Ohio, but ten years later the settlements of Christian Indians were broken up by Wyandot warriors. When, in 1796, Congress granted to the Moravian Indians the tract of land in Ohio which they had formerly occupied, Zeisberger was able to return to the place with a considerable number of converts and built the town of Goshen, where he died Nov. 17, 1808. He published a spelling-book (Philadelphia, 1776); a collection of hymns (1803); *Sermons to Children* (1803); and a *Harmony of the Four Gospels* (1821), in Delaware. *A Dictionary in German and Delaware* was published in 1887 (Cambridge) and *Essay toward an Onondaga Grammar* in 1888 (Philadelphia). See de Schweinitz, *Life and Times of David Zeisberger* (Philadelphia, 1870), and *Diary of David Zeisberger 1781–98* (Cincinnati, 1888).

Zeitz, tsīts: town; in the Prussian province of Saxony, in the circuit of Merseburg; on the White Elster, right affluent of the Saale; station of three state railways, 22 miles S. W. of Leipzig (see map of German Empire, ref. 4–F). The river is here crossed by four bridges, two of iron, one of stone, one of wood. The upper and the lower town are connected by a cable line. Zeitz has numerous manufactures of cottons and woolens, carriages, machinery, pianos, vinegar, sugar, spirits, cigars, and extensive woodcarving; dyeing and calico-printing are carried on. Considerable lignite deposits in the vicinity are utilized by mineral-oil factories. The city has four old churches, a gymnasium in the ancient Franciscan cloister with a library of 20,000 volumes, and other educational and charitable institutions. The bishopric Zeitz was founded by Otto I. in 968 for the conversion of the pagan WENDS (*q. v.*). Pop. (1890) 21,680. HERMANN SCHOENFELD.

Zelâ: See RABAT.

Zelaya, thā-lī'yăă, JOSÉ SANTOS: general and politician; b. at Managua, Nicaragua, about 1845. He was educated in England, joined the Nicaraguan army, was commissioned general in 1885, and was a man of wealth and a leader of the liberal party. In Apr.–June, 1893, he joined Zavala in the revolt by which President Sacaza was overthrown; but Zavala having been made provisional president, Zelaya revolted and forced him to resign at the end of July. A convention was then called which promulgated a new constitution, and under this Gen. Zelaya was elected president, with practically dictatorial powers, Sept. 17, 1893. In 1894 he occupied the Mosquito territory, and in May, 1895, the port of Corinto was held for a few days by a British force, in security for payment of indemnity claimed on account of the murder of a British subject; Nicaragua agreed to make the payment, and the force was withdrawn. H. H. S.

Zelle: See CELLE.

Zeller, tsel'ler, EDUARD: philosopher and theologian; b. at Kleinbottwar, a village of Würtemberg, Jan. 22, 1814; studied theology and philosophy at Tübingen under Baur and Strauss (whose life he subsequently wrote), at Berlin under Marheinecke, Neander, and Gans; privat docent at Tübingen in 1840, where he founded the *Theologische Jahrbücher*, which was continued till 1857, and formed the principal organ of the so-called Tübingen school of theology; called to Berne in 1847, to Marburg in 1849, to Heidelberg in 1862, and finally to Berlin in 1872. He resigned in 1894, retiring to Stuttgart. His *Philosophie der Griechen* (5 vols.; translated into English, French, and Italian) is a masterpiece of classical scholarship. A compendium of this large work, for the use of younger students, was published in a third edition in 1889. ALFRED GUDEMAN.

Zeller, Fr. pron. zel'lăr', JULES SYLVAIN: historian; b. in Paris, Apr. 23, 1820; studied in his native city, and subsequently in Germany; taught history in the lyceums of Bordeaux, Rennes, Strassburg, and Aix, and was appointed Professor of History at the Normal School of Paris in 1858, and of the École Polytechnique in 1869. He wrote *Ulrich de Hutten* (1849); *Histoire de l'Italie* (1852; 3d ed. 1875); *Épisodes dramatiques de l'Histoire d'Italie* (1855); *L'Année historique* (4 vols., 1860–63); *Les Empereurs romains* (1863); *Histoire d'Allemagne* (1872, *et seq.*); and other works. Revised by A. G. CANFIELD.

Zena'na [= Hind. *zenāna*, *zanāna* = Pers. *zanāna*, deriv. of *zan*, woman : Gr. γυνή, woman : Eng. *queen*]: that portion of the house of a high caste family of India which is devoted entirely to the use of the women and girls. Like the portion which belongs to the gentlemen, the zenana, or inner portion, is in the shape of a hollow square, with an open court in the center—the men's building toward the street, the women's back of it. The house is usually from two to three stories high, with verandas on each story running round the inner part opening on to the open court in the center. In the zenana there will sometimes be from fifty to a hundred ladies, or even more, all belonging to one family, yet all of them wives of different individuals. They have no common parlor or sitting-room elegantly furnished, like the ladies of the Turkish harem, but each one has her own little room, where she lives all her life and brings up her children, though she is permitted to go into any room

to visit the other women in the zenana, and the work-rooms and open court in the center of the building are free to them all. But she must never go out into the outer portion of the building, that which belongs to the gentlemen, as it is considered the greatest disgrace to be seen by any other man besides her own husband. Therefore, too, no man can enter the zenana, except that late at night he may go to his wife's room, after every woman has retired to her own apartment.

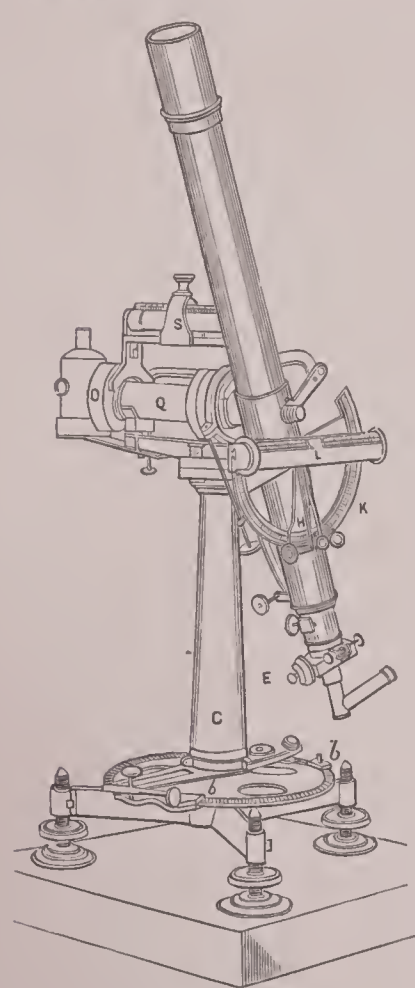
The lower rooms of the building are used as cooking-rooms and cow-sheds. When the birth of a child is expected, the poor mother is not allowed even the poor comforts of her own room, but is brought down and made to share the cow-shed with the cow, simply a strip of matting being placed between them, and here she has to remain for twenty-eight days. All this time she is considered polluted, and no one must speak to her but the low-caste coolie-woman who has acted as midwife. She must never have a doctor, no matter how great may be her sufferings. The little girls are married when they are six or seven years old, and most generally are mothers before they are quite eleven years of age. The son always lives in his father's house, and his little bride is taken there, so that often there are five or six generations living in one house. If the quarters become too straitened, another hollow square is built on, or another story is added to the buildings; some of the larger buildings have three or four of these inner courts, all belonging to the one zenana. Revised by R. LILLEY.

Zend-Avesta: See AVESTA.

Zenick: See SURICATE.

Zenith [from O. Fr. *cenith*, from Span. *zenit*, O. Span. *zenith*, from Arab. *semt* in *semt urras*, zenith, liter., way of the head]: the point in the celestial sphere directly over the head of the observer; the opposite of the *nadir*.

Zenith Telescope: an astronomical instrument for measuring small differences between the zenith distances of two stars passing the meridian on opposite sides of the zenith; the one north, the other south. It was designed by Capt. Andrew Talcott, U. S. Engineers, about the year 1834, and the method of determining the latitude, in which it is principally used, is hence known as *Talcott's method*. The principle of the method, however, is two centuries old, having been conceived and published by the Danish astronomer, Horreboe. The results obtained with this portable instrument rival in accuracy those of the instruments of a fixed observatory. The figure represents a zenith telescope of the Coast Survey, having an aperture of about 3½ inches, a focal length of about 45 inches, and a magnifying power varying between 120 and 160. The tube rotates around a horizontal axis, Q, and is counter poised by a weight at O. A striding-level at S indicates the deviation of this axis from horizontality. The essential parts of the instrument consist of the sensitive level, L, and the micrometer, E. The level is connected with the telescope, so that the inclination of its line of collimation may be known. The graduated semicircle K is attached to the tube, and by means of the vernier H, which is attached by an arm to the movable level L, zenith distances can be read to within 30″. The micrometer-screw is used for measuring apparent differences of zenith distance when the telescope is pointed alternately from the first star to the second star of a pair which culminate at opposite zenith distances, differing from each other by less than the diameter of the field of view of the telescope. The value of one revolution of the screw is about 45″, and the value of one division of the level L is about three-fourths of a second.



Zenith telescope.

In recent times the instrument has acquired new importance from its use in measuring the minute changes of latitude to which all places on the earth's surface are now known to be subject. Revised by SIMON NEWCOMB.

Zenkoji, zen′kō′jĕĕ′, or **Nagano**: town of Central Japan; on the through railway from Tokio to the west coast; the capital of the province of Shinshu. It is finely situated close to the swift Nagano river, and at the foot of lofty mountains. Its Buddhist temple is one of the most famous in Japan, and resorted to by thousands of pilgrims; it is dedicated to Amida and his two followers, Kwannon and Daiseishi; the sacred group of their images is a treasured relic. The greatest feast is held on July 31. In 1847 a desolating earthquake visited the city and neighborhood, ruining 15,000 acres of arable land, blocking up the river, and causing the death of 30,000 persons. Zenkoji has considerable trade in woven goods and agricultural implements. Pop. (1894) 28,751. J. M. DIXON.

Ze′no: emperor of the Eastern empire (474–491); was an Isaurian by birth; married in 469 Ariadne, a daughter of the Emperor Leo I. On the death of Leo I. the succession was fixed on Leo II., a son of Zeno and Ariadne, but as Leo II. died in the same year as Leo I., in 474, Zeno came into possession of the crown. His reign was disturbed by contests with his rivals and by several revolts. The Goths were especially troublesome, but the emperor finally got rid of them by commissioning their chief, Theodoric, to conquer Italy and expel the usurper Odoacer. An important event of his reign was his issuance of the *Henoticon* or decree of union (482) designed to put an end to the Monophysite controversy. It reaffirmed the doctrines of the Nicene Creed, and renewed the condemnation of Nestorius and Eutyches, but was ambiguously worded on the main point at issue, i. e. the duality of natures in Christ. D. in 491.

Zeno, APOSTOLO: dramatist and historian; b. at Venice, Dec. 11, 1668; devoted himself to literature, and acquired great fame by his dramatic compositions; founded in 1710 the celebrated periodical, *Giornale dei Letterati d'Italia*; went in 1718 to Vienna as court-poet and historiographer; returned in 1729 to Venice, and died there Nov. 11, 1750. His dramatic works were published in 10 vols. at Venice in 1744. Among his other works are *Dissertazioni istorico-critiche* (2 vols., 1752–53), and *Epistolè* (6 vols., 1785). Revised by A. G. CANFIELD.

Zeno′bia: Queen of Palmyra. The daughter of a Syrian chieftain, she married Odenathus, who from a private station became Prince of Palmyra, and virtual master of the East, and who, because of his brilliant campaigns against the Persians, was declared Augustus and coregent of the empire by Gallienus. In 267 Odenathus was murdered by his nephew Mæonius. Thereupon Zenobia assumed the title of Queen of the East, asserted her independence of Rome, defeated the Roman general Heraclianus, and extended her authority over Syria, parts of Asia Minor, Mesopotamia, and Egypt. Aurelian marched against her in 272. He won the two pitched battles of Antioch and Emesa, where she commanded in person, and then besieged Palmyra, which she defended with desperation. Finally, Zenobia fled from her capital to seek the assistance of the Persians, but was captured on the Euphrates. Her subsequent history is involved in obscurity. The commonly received account represents her as a captive, laden with jewels and silver chains, and walking before Aurelian's chariot on his triumphal entry into Rome in 273; then as living as a Roman matron in a villa near Tibur, and marrying her daughters to Roman patricians. Another account says that she starved herself to death after her capture. Her son received a principality near the Armenian frontier. Zenobia was a woman of extraordinary beauty and accomplishments. She spoke Greek, Latin, Syriac, and Coptic. She was brave and wise in battle, judicious in the council chamber, and economical and shrewd in administration. She is perhaps the only woman in the East "whose superior genius broke through the servile indolence imposed on her sex by the climate and manners of Asia." EDWIN A. GROSVENOR.

Zeno of Elea: philosopher; b. about the beginning of the fifth century B. C. at Elea; a friend and disciple of Parmenides, whose doctrines he supported by indirect demon-

stration (*reductio ad absurdum*); is reported to have been adopted as a son by Parmenides, who was twenty-five years his senior. Aristotle names him as the father of dialectics, from the circumstance that his arguments in favor of the Eleatic doctrine of Being were based upon the self-refutation of its opposite. This negative dialectic established the truth of Being as One, by showing the contradiction inherent in the hypotheses (*a*) of motion, (*b*) of multiplicity, (*c*) of sense-perception: "The flying arrow is at rest, because at every moment it is only in one place"; "Achilles can not overtake the tortoise, because as often as he reaches the place occupied by the tortoise the previous moment, the latter has left it"; "Motion can not begin, because a body can not arrive at a given place before it has passed through an infinite number of intermediate spaces." Aristotle in his *Physics* (vi.) pointed out the fallacy in his arguments against the reality of motion. In Plato's *Parmenides* a writing of Zeno's is referred to as containing a prolix argument to prove that Being is One, but this writing has been lost. Strabo reports him to have participated in the ethico-political efforts of Parmenides, and we are told by Diogenes Laertius that, being unsuccessful in that, he was taken by Nearchus the tyrant and put to a cruel death. Zeller's *Pre-Socratic Philosophy*, vol. i., gives what is known of him and his doctrines. WILLIAM T. HARRIS.

Zeno Ridolfo: See SCHADOW, RUDOLPH.

Zenos, ANDREW CONSTANTINIDES, D. D.: educator; b. at Constantinople, Turkey, Aug. 13, 1855; was educated at Robert College, Constantinople, Princeton College and Seminary; pastor of the Presbyterian church at Brandt, Pa., 1881–83; Professor of the Greek Language and Literature in Lake Forest University 1883–88; of New Testament Literature and Exegesis in Hartford Theological Seminary 1888–91; of Biblical and Ecclesiastical History in McCormick Seminary 1891–94, and since 1894 Professor of Biblical Theology. Dr. Zenos has published an edition of Xenophon's *Anabasis* (Boston, 1888) and a translation of *Socrates's Ecclesiastical History*, in vol. ii. of the Nicene and Post-Nicene Fathers (New York, 1890). C. K. HOYT.

Zeno the Stoic: b. about 350 B. C.; son of a Phœnician merchant residing in Cittium, a Greek city on the island of Cyprus; was occupied in commerce until near his thirtieth year, when a shipwreck caused him to visit Athens, where he read the works of Xenophon and Plato, and conceived a great admiration for their master, Socrates, and accordingly became a disciple of Crates the Cynic, who imitated the external peculiarities of Socrates. Becoming sated with this phase of the Socratic school, he resorted to Stilpo the Megarian, who initiated him into the dialectics by which the nugatoriness of sense-perception is exhibited. He afterward joined Xenocrates and Polemon of the first Academic school, and about the year 310 B. C. founded his own school in the Στοὰ ποικίλη (porch adorned with paintings by Polygnotus), whence the name "Stoic" arose. He taught fifty-eight years, according to Apollonius, dying about 258 B. C., by his own hand. Diogenes Laertius (vii.) mentions a number of works attributed to him, but none of them have been preserved. His doctrines were considered by the ancients to be not so much new in substance as new in terminology. He combined the ethics of the Cynic school with the physics of Pythagoras and Heraclitus, and introduced a modified logic. See STOICS. WILLIAM T. HARRIS.

Ze'olite [from Gr. ζεῖν, to boil + λίθος, stone]: the name of a large group of minerals which swell up under the blowpipe, whence the name. They are generally hydrated double silicates in which the principal bases are sodium or aluminium and calcium; are decomposed by acids, sometimes with gelatinization; and are mostly crystalline or sub-crystalline. They are often deposited in cavities in plutonic rocks, and have been found infiltrating ancient walls built by man. They are formed from watery solutions.

Zephani'ah [from Heb. *Tsᵉphanyāh*, liter., whom Jehovah hid, i. e. defended]: the ninth in order of the minor Hebrew prophets; was great-great-grandson to Hezekiah, perhaps the king of that name, and prophesied under Josiah 638–608 B. C. (Zeph. i. 1). The book, like Joel and Obadiah, is a monograph on "the day of Jehovah" (i. 7–11, 14–18, iii. 8, 11, 16, 19, 20), containing a threat of judgment (i.), an exhortation to repentance (ii. 1–iii. 8), and a promise of salvation (iii. 9–20). It probably belongs to the early reign of Josiah, after the partial reformation of the later years of Manasseh. W. J. B.

Zerafshan': one of the gold-bearing rivers of Bokhara; the main stream of the Russian district of Zerafshan, which was formed in 1868, enlarged in 1870, and now comprises an area of 1,756 sq. miles. It rises under the name of Masja at the foot of an immense glacier of the Alai range, and passes through the Lake of Iskander. In its upper course it is a wild mountain stream; during its middle course it irrigates extensive rice and cotton fields, orchards and mulberry plantations, for which purpose it is led into numerous canals above Samarkand to the city of Bokhara. A little to the E. of Samarkand it sends out a northern branch, which after several miles of fertilization is absorbed in the sand; the southern branch, which is connected with the Amu by irrigating canals, has recently lost itself also among the steadily extending sand wastes; consequently the country is being more and more depopulated, about 100,000 Tajiks (of Persian orgin) and Uzbegs (of Turkish origin) having removed since the Russian dominion over the country. Since the capture of Tashkend by the Russians in 1865 and of Samarkand in May, 1868, and through the command of the upper Zerafshan, the whole country has been practically under Russian sway, and has belonged to Russian Turkestan since the annexation of Merv in 1884.

Revised by HERMANN SCHOENFELD.

Zeram: See CERAM.

Zerbst, tserbst: district town; in the duchy of Anhalt, Germany; formerly capital of the principality of Anhalt-Zerbst; on the Nuthe; 11 miles N. W. of Dessau, on the Magdeburg-Leipzig railway line (see map of German Empire, ref. 4–F). It has manufactures of gold and silver ware, machinery, carriages, chemicals, soap, spirits, and beer; market-gardening is extensively cultivated. The beautiful castle (built 1681–1750) was the residence of the ruling family till 1793; it now contains the ducal archives with documents dating back to 941. There are five churches, a gymnasium, a quaint old town-hall which contains a parchment Bible of 1541 with paintings by Lukas Cranach and others. Zerbst is an ancient town, which became part of the Brandenburg bishopric in 949. Pop. (1890) 16,181.

HERMANN SCHOENFELD.

Zero [from Fr. *zéro*, from Ital. *zero*, *zifro*, from Arab. *çifrun*, *çafrun*, empty, cipher, zero]: in physics, the point in space or time which serves as the origin or base of measurements. Thus upon a linear scale there is always a zero reading from which the count is made.

It follows that the zero is always arbitrary and relative, although in some cases it takes on a semblance of absolute character. An example is the so-called *absolute scale* of temperature (see articles THERMOMETER and THERMOMETRY), which is defined as follows: Suppose a cylinder to contain a perfect gas. If the volumes of the gas at the temperatures of melting ice and of boiling water respectively be noted and the same be indicated by lines upon the cylinder at proper distances from the closed end, and if the intervening space be divided into one hundred parts, each of these will be a degree of the centigrade scale. The division may, however, be carried downward, in which case it will be found that the 273d division below that corresponding to the ice-point coincides with the bottom of the cylinder. The point −273° C. is therefore called the *absolute zero*.

Familiar examples of purely arbitrary zeros are that of the Fahrenheit thermometer, the various meridians from which longitude is counted, the zero of the daily counting of time, etc. The choice of such points of reference is sometimes dictated by considerations of symmetry, sometimes by practical convenience; the most important consideration being that the zero should be capable of definition in a simple and unmistakable manner. E. L. N.

Zerrahn, CARL: orchestral conductor; b. at Malchow, Mecklenburg, Germany, July 28, 1826; removed to the U. S. in 1848 as flutist in the Germania Orchestra, a body of young musicians, the majority of whom had left their native land on account of the revolution of 1848. Zerrahn was appointed conductor of the Boston Handel and Haydn Society in 1854, a position which he still retains. Until 1882 he was conductor of the Harvard symphony concerts. He is conductor of the annual festivals at Worcester, Mass., and his influence has been widely felt throughout New England as a promoter of choral and orchestral societies. D. B.

Zerub'babel [from Heb. *Zᵉrubbābhel*, either from *zᵉrūbhābhel*, scattered to Babylon, or from *zᵉrū'a bābhel*, born at Babylon]: the prince of the tribe of Judah and civil (Joshua

being the sacerdotal) head of the first Jewish colony returning from the captivity in Babylon by permission of Cyrus, 536 B. C. (Ezra ii. 2, 64), under whom the second temple was built.

Zetland Islands: See SHETLAND ISLANDS.

Zet'terstedt, JOHAN WILHELM: naturalist; b. in the circle of Östergotland, Sweden, May 20, 1785; studied natural history, especially botany, and subsequently also entomology, at the University of Lund: began to lecture there in 1810; was appointed professor in 1839; retired in 1853. He visited Öland in 1811 and 1817, Gotland in 1819 and 1841, and made extensive travels in Lappmark in 1821, 1832, and 1840. Besides reports of his travels and minor essays, he published *De Plantis cibariis Romanorum* (1808); *Dissertatio de Fecundatione Plantarum* (3 vols., Lund, 1810–12); *Orthoptera Sueciæ* (Lund, 1821); *Fauna Insectorum Lapponica* (Hamburg, 1828); *Monographia Scatophagorum Scandinaviæ* (Paris, 1835); *Insecta Lapponica* (Leipzig, 1838–40); *Diptera Scandinaviæ* (14 vols., Lund, 1842–60). D. at Lund, Dec. 23, 1874.

Zettinie: See CETTINJE.

Zeuglodon'tia [Mod. Lat.; Gr. ζεύγλη, strap or loop of a yoke + ὀδούς, ὀδόντος, tooth]: a group of extinct mutilate mammals, generally regarded as a sub-order of the order Cete, but sometimes raised to independent ordinal rank. The distinctive characters were as follows: The skull was much more like the ordinary mammalian type than it is in either of the existing sub-orders; the intermaxillaries were expanded forward, normally interposed between the supramaxillaries, and formed the terminal as well as anterior portion of the lateral margins of the upper jaw; the nasal apertures opened more or less anteriorly, and never so far backward as in the Denticete or Mysticete; the olfactory organs must consequently have been moderately developed; the lower jaw had the rami connected by suture at the symphysis; the teeth approached to the normal mammalian type, the dental formula being I. $\frac{3}{3}$ C. $\frac{1}{1}$ PM + M $\frac{5-6}{5-6}$, and those of the supramaxillary were mostly two or three rooted; the roots were so large and connected by the crowns in some of the species to such an extent as to have produced the resemblance to a yoke to which the ordinal name alludes. The fore limbs were modified into short paddles; no traces of hind limbs have as yet been found. The representatives of the order existed during the Tertiary epoch, and ranged from the Eocene to the Pliocene. They are supposed to have been derived from the same common progenitors as the seals, but this supposition remains to be verified. Some of the species attained a gigantic size; e. g. *Zeuglodon cetoides* of the Jackson beds (Middle Eocene) of the U. S., of which remains found indicate a length of over 70 feet, while others were little larger than porpoises. They were prevalent in ancient times almost if not quite as extensively as the living cetacean types, remains having been found in North and South America, as well as Europe and Asia. They have been differentiated into two families—*Zeuglodontidæ* and *Cynorcidæ*. Revised by F. A. LUCAS.

Zeus (in Gr. Ζεύς): the chief god of the Grecian mythology. He is fundamentally the god of the light of day; he reigns in heaven the king of gods, and sits enthroned in ether on high mountains, where he gathers the clouds and sends forth the rain and the storm. He is the son of Cronus and Rhea. Cronus had been warned by the Titans that he would be robbed of throne and virility alike by his children. He therefore swallowed his children as they were born. But when Rhea was delivered of Zeus, she followed the advice of GAIA (*q. v.*) and substituted a stone for the child, who was secretly reared in a cave on Mt. Ida in Crete by a nymph, Amalthea, while the Corybantes and Curetes clanged their weapons in order to prevent the cries of the infant god from reaching the ears of Cronus. At the end of one year Zeus was powerful enough to attack his father, to whom, at the suggestion of Metis (wisdom), he gave an emetic, and thus caused him to vomit forth the elder brothers and sisters of Zeus. With the help of the Hundred-handed and the Cyclopes the youthful gods overcame the Titans, and Zeus unmanned and deposed his father Cronus. The Titans were banished to the abyss of Tartarus, and Zeus apportioned out the empire of the universe, reserving to himself the realm of heaven, while he gave the empire of the sea to Poseidon, and that of the lower world to Hades. By the machinations of Gaia the GIANTS (*q. v.*) were created in order to avenge her children the Titans, and to dethrone the new gods. But, chiefly owing to the personal prowess of Zeus, the Giants were overcome, and the new order of things was firmly established.

Zeus is the father of gods and heroes. His first wife was Metis, who foretold to him that the child in her womb would dethrone him. Zeus therefore swallowed her, and himself shortly thereafter gave birth to the child of Metis, Athene, who sprang full-armed from her father's head, which had been cloven by Hephæstus. The second wife of Zeus was Themis (right), who bore to him the Hours (seasons) and the Fates. His third wife was his own sister Hera, who bore to him Ares, Hebe, Ilithyia (and Hephæstus). By other goddesses and mortal maidens he became the father of a numerous and important progeny: by Mnemosyne, of the Muses; by his sister Demeter, of Persephone; by Dione, of Aphrodite; by Leto, of Apollo and Artemis; by Eurynome, of the Graces; by the Argive Niobe, of Argus and Pelasgus; by Maia, of Hermes; by Taÿgete, of Lacedæmon; by Electra, of Dardanus; by Semele, of Dionysus; by Europa, of Minos, Sarpedon, and Rhadamanthus; by Io, of Epaphus; by Danaë, of Perseus; by Leda, of Pollux and Helen; by Alcmene, of Heracles, etc.

In addition to being the god of the storm-cloud, Zeus, because of his prowess in the wars with Titans and Giants, is the god of physical vigor, and therefore he was the patron of the Olympic games. He was furthermore the god of prophecy, though he spake his oracles chiefly through the mouth of Apollo. He also presided over purifications and atonements, and over the life of the family and of the state. His accompanying attributes are the scepter, the thunderbolt, and the eagle. The chief seats of his worship were Dodona and Olympia, though he was worshiped at a great number of other places. For the temple of Zeus at Olympia Phidias made a statue of the god in gold and ivory that was renowned throughout antiquity.

For a masterly analysis of the functions and character of Zeus, see Preller's *Griechische Mythologie* (edited by Carl Robert, Berlin, 1887), and for an account of Zeus in art, see Baumeister's *Denkmäler*, s. v. *Zeus*. J. R. S. STERRETT.

Zeux'is: painter; of whom many anecdotes are told by Lucian and Cicero, and especially by Pliny in his *Natural History*. His birthplace is stated as Heraclea, but which city of that name is not known. The date of his birth is uncertain; it is only known that he was painting and already famous in 424 B. C., and very probable that his career was in the years 450–400 or thereabout. There is no painter of antiquity of whom more or stranger anecdotes are told, but a real knowledge of what his art was like is not possible to moderns. RUSSELL STURGIS.

Zhitomeer: another spelling of JITOMIR (*q. v.*).

Zhukov'skiĭ, VASILIĬ ANDREEVICH: poet; b. in the government of Tula, Russia, Jan. 29, 1783; d. Apr. 12, 1852. His mother was a Turkish captive, and he was brought up largely by and among women, which may have helped to give his character the softness which distinguished it. He served in the campaign of 1812 against Napoleon, later lived for a time in Dorpat; in 1816 was given an imperial pension, and in 1826, on the accession of Nicholas I., was made the tutor of the future emperor, Alexander II. The last ten years of his life were spent in Germany. As an original poet Zhukovskiĭ does not rank very high, though his ballad *Lĭudmilla* (an imitation of Burger's *Lenore*) was the first national effort of its kind. His *The Minstrel in the Russian Camp* also had a great success at the time, and others of his attempts have merit. His importance is as a translator, for it was he who by first making known to his countrymen the romantic writings of England and Germany led the way for the romantic school in Russia. He translated with great success poems of Gray, Byron, Moore, Scott, Goethe, Schiller, Ruckert, etc., also *Don Quixote* and the *Odyssey* (from a German prose rendering). The sixth edition of his works appeared in 1859. Some of his own pieces have been put into English verse in *Specimens of the Russian Poets* by John Bowring (2 vols., 1821–23).

ARCHIBALD CARY COOLIDGE.

Zia: See **Zea**.

Zic-zac: See CROCODILE BIRD.

Zidon: See SIDON.

Ziegenbalg, tsēē'gen-baalch, BARTHOLOMEW: first Protestant missionary to India; b. at Pullsnitz, Saxony, June 24, 1683. After a gymnasium course at Görlitz he formed the acquaintance of Spener and Baron von Canstein, through

whom he entered the University of Halle in 1703. Responding with another Halle student, Henry Plutschau, to the call of Frederick IV. of Denmark for missionaries to the Danish possessions in India, he embarked at Copenhagen Nov. 29, 1705, and reached Tranquebar, in Southern India, July 9, 1706. Although opposed by the authorities, being imprisoned for four months, he laid the foundation of an extensive mission work, learning the Tamil language, compiling a grammar and two lexicons, and within two years after his arrival beginning the translation of the Bible. The New Testament was completed in 1711. The Pentateuch, Joshua, and Judges were also translated. On his return in 1715 he met with a warm reception in both Germany and England, where the Society for the Propagation of the Gospel gave him its encouragement. Returning to Tranquebar in 1716, he died Feb. 23 (o. s.), 1719. See Germann, *Ziegenbalg u. Plutzschau* (Erlangen, 1868); Plitt, *Kurze Geschichte der lutherischen Mission* (Erlangen, 1871). For his journals, letters, and contemporaneous and nearly contemporaneous accounts, see the *Halle Reports*, edited by G. A. Francke. H. E. JACOBS.

Ziegler, tseech'ler, ERNST, M. D.: pathologist; b. at Messen, Switzerland, Mar. 17, 1849; studied at Berne and at Würzburg, where he graduated M. D. 1872; subsequently received the appointment of assistant in the anatomico-pathological institute of the university; in 1878 was made assistant in the pathological institute of the University of Freiburg, subsequently Extraordinary Professor of Pathology in that institution; in 1881 was Professor of Pathological Anatomy and General Pathology in the University of Zurich, and in 1882 accepted the same chair in the University of Tübingen. His most important work is *Lehrbuch der pathologischen Anatomie*, which has passed through a number of editions. S. T. ARMSTRONG.

Ziem, zeem, FÉLIX: marine and landscape painter; b. at Beaune (Côte-d'Or), France, Feb. 25, 1821; studied at the Dijon Art School; received a third-class medal at the Salon of 1851, a first-class medal in 1852, and a third-class medal at the Paris Exposition of 1855; became an officer of the Legion of Honor 1878. Most of his pictures represent scenes in Venice, and as he is a most prolific painter he has a wide reputation. His *View of Venice*, painted in 1852, is in the Luxembourg Gallery, Paris. *Inundation of Piazza San Marco, Venice*, is in the Wolfe collection, Metropolitan Museum, New York. Studio in Paris. WILLIAM A. COFFIN.

Ziemer, tseem'er, HERMANN: classical philologist; b. at Neustettin, in Pomerania, May 12, 1845; studied at the University of Berlin; teacher in gymnasium at Stargard 1870–73; professor in the gymnasium at Colberg since 1873. Author of *Psychologische Erklärung syntaktischer Erscheinungen* (1867); *Das psychologische Moment in der Bildung syntaktischer Sprachformen* (1879); *Junggrammatische Streifzüge im Gebiete der Syntax* (1882; 2d ed. 1883); *Vergl. Syntax der indogerm. Comparation* (1884); also various articles and reports in journals. His work is characterized by much freshness and vigor, and has served to advance the science of comparative syntax rather by its suggestiveness and its sympathy with new endeavors than by its precision. B. I. W.

Zierikzee, zee'rik-zā: town; province of Zeeland, Netherlands; on the island of Schouwen (see map of Holland and Belgium, ref. 7–D). It has a good harbor, extensive ship-building, shipping, and fishing, and a large trade in agricultural products. Its walls, behind which its citizens made an obstinate resistance to the Spaniards in 1576, are now transformed into promenades. Pop. (1890) 7,060. Revised by M. W. HARRINGTON.

Ziethen, or **Zieten**, tsee'ten, HANS JOACHIM, von: general; b. on his paternal estate of Wustrau, Prussian province of Brandenburg, May 14, 1699; received a military education, and entered a regiment of dragoons as lieutenant in 1726, but became entangled in the difficulties of one of his comrades, and was cashiered. In 1730, however, he was reinstated in the army as lieutenant in a regiment of hussars just then forming, and served in the campaign against France in 1735. Soon after the outbreak of the first Silesian war he became lieutenant-colonel, and early in the second Silesian war was made major-general. In 1745 he made his famous march to Jägerndorf through the Austrian lines, and distinguished himself at Hohenfriedberg and at Hennersdorf. Shortly after the peace some disagreement arose between him and the king, and a reconciliation did not take place until 1755, but in the Seven Years' war he took a most brilliant part, as commander of the cavalry, in the battles of Prague, Kolin, Leuthen, Liegnitz, and Torgau, rendering especially valuable service in the last-named battle, which he decided in favor of the Prussians by storming the heights of Siptitz, and after the peace he retired to his estates as the most popular and one of the most celebrated of the generals of Frederick the Great, though he had many peculiarities approaching closely to the ridiculous. D. at Berlin, Jan. 26, 1786. His *Life* has been written by Hahn (5th ed. 1878) and by Count Lippe-Weissenfeld (2d ed. 1886). Revised by F. M. COLBY.

Zikr: See DERVISHES.

Zileh (anc. *Zela*): town; in the vilayet of Sivas, Asiatic Turkey. Here Mithridates defeated the Romans (67 B. C.). Here Cæsar conquered Pharnaces (47 B. C.) and sent the famous dispatch, "*Veni, vidi, vici.*" The present town is lifeless and decaying, though still maintaining the annual fair in November, which was formerly frequented by 50,000 or 60,000 persons. Pop. 5,000. EDWIN A. GROSVENOR.

Ziller, tsil'ler, TUISKON: educator; one of the foremost exponents of the Herbartian pedagogy; b. in Wasungen, Saxe-Meiningen, Germany, Dec. 22, 1817; became in 1864 professor in the University of Leipzig, where he founded a pedagogical seminary modeled after that of Herbart at Königsberg. His most influential work, *Grundlegung zur Lehre vom erziehenden Unterricht* (Basis of the Doctrine of Instruction as a Moral Force), appeared in 1865, and from its appearance dates the beginning of popular interest in Herbart. Ziller's other important works are *Einleitung in die allgemeine Pädagogik* (1856); *Die Regierung der Kinder* (1857); *Allgemeine Pädagogik* (2d ed. 1884); *Allgemeine philosophische Ethik* (1880). De Garmo characterizes Ziller's work as follows: "It deserves respect as the most thoroughgoing attempt ever made to answer the question, How may instruction in the common school become an instrument for the development of moral character?" See De Garmo, *Herbart and the Herbartians* (New York, 1895). D. in Leipzig, Apr. 20, 1882. C. H. THURBER.

Zillerthal, tsil'ler-tăal: one of the principal valleys of the Tyrol, 50 miles long, inclosed by lofty glaciers and opening N. into the valley of the Inn. Rearing of cattle and manufactures of gloves and essences of herbs are the principal occupations. In 1837 399 persons, who had left the Roman Catholic Church, were compelled to leave their homes and emigrated to Prussia. Pop. 14,000.

Zimmermann, tsim'mer-măan, JOHANN GEORG, von: physician and philosophical writer; b. at Brugg, canton of Berne, Switzerland, Dec. 8, 1728; studied medicine at Göttingen; began to practice at Brugg in 1751; was appointed court physician at Hanover in 1768. D. Oct 7, 1795. He had a great reputation; was invited to the court of Catharine II.; attended Frederick the Great in his last illness; published *Vom Nationalstolze* (Zurich, 1758); *On Solitude* (*Ueber die Einsamkeit*, Zurich, 1755; 2d ed., Leipzig, 4 vols., 1784–85), which made his name celebrated throughout the whole of Europe; *Von der Erfahrung in der Arzneikunst* (Leipzig, 2 vols., 1764), which was translated into several foreign languages; *Ueber Friedrich den Grossen und meine Unterredung mit ihm kurz vor seinem Tode* (1788); and *Fragmente über Friedrich den Grossen* (3 vols., 1790), which implicated him in some very bitter controversies. A collection of some of his letters was published at Aarau in 1830. See also *Zimmermanns Krankengeschichte* (1786), by Wichmann. Revised by S. T. ARMSTRONG.

Zinc, sometimes called **Spelter** [*zinc* = Fr., from Germ. *zink*; with *spelter*, cf. Germ. and Dutch *spiauter*, and Dutch *piauter*, pewter, whence Eng. *pewter*]: one of the metallic elements, very abundantly distributed, comparable in this respect to lead. It was not known in metallic form to the ancients, though they knew how to make alloys of it with copper (common brass) by adding zinc ores to melted copper. Zinc being one of those metals, however, which must be procured by a process of *distillation*, was doubtless beyond the skill of the metallurgists of old. It was first, and for a long time, brought into Europe from the East, and it is not much more than 100 years since zinc was first smelted in Europe. The ores of zinc are not numerous, there being only six mineral species which furnish all the zinc and zinc-white of commerce. These are BLENDE, CALAMINE, WILLEMITE, SMITHSONITE, FRANKLINITE, and ZINKITE (*qq. v.*), including sulphide, silicates, carbonate, and oxide. The sul-

phide and carbonate are first roasted to expel sulphur and carbonic acid. Calamine also contains water, which must be expelled by roasting. The ores, thus prepared, are distilled, in admixture with carbon, in retorts, or furnaces of special construction, the zinc-vapor generally carrying with it some lead, sulphur, and arsenic. Most commercial zinc, when required pure, must be redistilled. That which is made from calamine, or from the willemite, franklinite, and red zinkite of New Jersey, is free from arsenic, and generally quite pure. When made from blende it sometimes contains cadmium, and more rarely traces of indium.

The metal zinc is one of much hardness, with a bluish color, with a brilliant luster when freshly cut, but soon taking a tarnish, from the formation of a film of suboxide or carbonate, which protects it quite strongly from further oxidation, so that it is an extremely durable metal, resisting both air and water very persistently. When cast, it is highly crystalline in structure, and somewhat brittle, though at the same time sectile; but by heating to a temperature somewhat below 300° F., it may be rolled into very thin plates, passing into a modification which is quite malleable, so that sheets as thin as tin-foil may be obtained. The best way to obtain it pure is by electrolysis. At a temperature but little higher than that mentioned still another allotropic modification appears, which is very brittle and fragile, and in a mortar heated to 400° F., or a little higher, the metal may be crushed to powder. It melts at about 780° F., and boils at about 1900° F., yielding a vapor which takes fire in the air and burns with a dazzling light to zinc oxide. (See ZINC-WHITE.) The relations of zinc to acids and other solvent liquids are highly interesting. When chemically pure it dissolves readily in nitric acid, but not so in dilute sulphuric and hydrochloric. Even ordinary commercial zinc, containing lead, iron, etc., may be almost absolutely protected from the latter two acids by the thinnest film of mercury, which in voltaic batteries is used, therefore, for this purpose. On contact, however, with most other metals, and other substances capable of conducting electricity, voltaic circuits are set up, and the zinc dissolves, hydrogen being evolved from the surface of the other metal. Hence, through the formation of such circuits with its metallic impurities, commercial zinc is readily soluble in acids, and even in solutions of neutral salts. These same relations explain the well-known protective action of zinc upon iron or copper, even in sea-water (as in the case of sheathing of ships). The film of hydrogen formed upon the surface of the other metal prevents all oxidizing action thereon. Zinc is largely used for coating iron and copper, exerting a protecting influence, both as a mere coating or impervious varnish, and through its voltaic relations. (See ZINCKING OF METALS.) Zinc dissolves also in alkalies, whose compounds with its oxide are soluble, in a manner similar to that above described, its relations to other metals in such alkaline liquids being altogether similar to those in acid and saline solutions.

ALLOYS OF ZINC.—Almost all the other common metals, except *lead* and *bismuth*, alloy readily with zinc, forming alloys that generally partake of the hardness of the zinc, and, when the latter is in excess, of its brittleness also. Under BRASS will be found some mention of the highly important alloys with *copper*, these being by far the most valuable of zinc alloys. With *lead*, zinc will not unite unless through intermediation of some other metal, such as *tin*, which alloys with both; with lead and bismuth also, equal quantities of each of the three metals, a fusible alloy is obtained which melts in boiling water. Bronze, which properly consists of tin and copper, is often alloyed with zinc, and triple alloys of these three metals are used for journal-boxes and some other purposes. An alloy with eleven times its weight of tin is beaten into leaves and used as a spurious substitute for silver-leaf. *Amalgams* of zinc have little interest except in connection with voltaic batteries.

COMPOUNDS OF ZINC.—Zinc forms a number of compounds which are useful in the arts. For the *oxide*, see ZINC-WHITE. The *sulphide* of zinc is found constituting two mineral species, identical in composition, but differing in crystalline form—*blende* or *sphalerite*, which is of the regular system, and *wurtzite* (named after the French chemist, Adolphe Wurtz), which is hexagonal. Hydrous *silicate* of zinc is found in nature as calamine. It is used as a pigment for producing a brilliant green in glazed pottery.

Zinc-vitriol, White Vitriol, or Zinc-sulphate.—This is a familiar commercial compound, also occurring in nature as *goslarite*. For commercial use it is prepared by roasting and then lixiviating blende, or by dissolving metallic zinc in dilute sulphuric acid, and crystallizing. Its composition is $ZnSO_4.7H_2O$. Crystals right-rhombic, efflorescing in the air, with loss of part of their crystal-water. At 212° F. they lose $6H_2O$, the seventh equivalent requiring a much higher temperature. White vitriol dissolves in 2·33 times its weight of cold water, and less than its weight of boiling water. It has an acrid metallic taste, and is very powerfully emetic in its effect when swallowed in any quantity. It is used in medicine, both directly and as a material for preparation of other medicinal zinc compounds.

Zinc Chloride ($ZnCl_2$), *Butter of Zinc.*—Zinc combines powerfully with chlorine, thin foil taking fire therein spontaneously. The substance formed is whitish, translucent, of the consistence of wax, melts at a low temperature, and sublimes at a red heat, condensing in white needles. It is highly deliquescent, and soluble in water and alcohol. The aqueous solution has several uses in the arts. It is used for "burnettizing" wood (see PRESERVATION OF TIMBER) and as a disinfecting agent. Revised by IRA REMSEN.

Zincking of Metals: the plating of metals with a thin layer of zinc, by which they are protected from the oxidizing action of the air. Iron is the metal oftenest coated, but copper is also sometimes treated in the same manner. In the preparation of zinked iron (so-called "galvanized iron") the metal is first cleansed by immersion in a warm bath of equal parts of sulphuric or hydrochloric acid and water, after which it is cleaned by rubbing with emery; it is next dipped in a bath of equal parts of saturated solutions of chloride of zinc and chloride of ammonium, then into a metallic bath consisting of 640 parts by weight of zinc, 106 parts of mercury, and about $\frac{1}{3}$ part of sodium, where it is allowed to remain until it acquires the temperature of the melted metal (680° F.). In order to avoid the partial solution of the iron by the action of the molten zinc, it is advisable to add pieces of wrought iron to the bath, so that it may previously become partially saturated. Iron castings are treated by a somewhat similar process: they are first cleaned by rubbing with sand, then heated, and immersed while still hot in a concentrated solution of chloride of zinc containing sulphate or chloride of ammonium, after which they are dipped in a bath of molten zinc, the surface of which is kept free from oxide by means of a little sal-ammoniac. The protective action of the zinc coating obtained as above described is said to exceed that of the tin upon ordinary tinned iron; increased strength is also imparted to the iron by the zinc, and its welding properties are not impaired. Copper objects can be zincked by immersion in a concentrated and boiling solution of chloride of ammonium, in which granulated or powdered zinc has been placed, or by simply dipping them in a boiling solution of chloride of zinc. Zincked iron is extensively employed for telegraph wires, roofing purposes, water-coolers, etc.

Zincog'raphy [*zinc* + Gr. γράφειν, write, engrave]: the art of producing impressions of prints and other designs on zinc, from which a facsimile on paper can be made. It is very analagous to LITHOGRAPHY (*q. v.*); the term is applied to the processes of *anastatic printing* (*anastasis*, resuscitation), *zinc-printing*, *paniconography*, and *photozincography*. In *anastatic* printing, first used in Germany in 1840, a printed sheet is moistened with water containing nitric acid, which affects only the parts where there is no printing, being repelled from the letters by virtue of the oily matter in them. The sheet is then pressed on a prepared zinc plate, whereby a typographical surface is produced, from which impressions can be printed on paper. *Zinc-printing* consists in first etching designs in the metal with the needle, cleaning them with acid, and covering the entire plate with a layer of fusible metal, which is afterward removed by planing until the etched lines appear at the surface; the plate is then dipped in an acid bath, when the surface of the plate will be dissolved, but not the fusible metal which fills the lines; in this way a relief-drawing, suitable for the printing of maps, plans, etc., can be obtained. In the process of *paniconography*, crayon drawings, proofs of wood or copper plates, etc., are transferred to a zinc plate, a damp inked roller is passed over it to deepen the impression, and powdered rosin then spread on it, which adheres only to the parts that were moistened by the ink. Upon now placing the plate in a bath consisting of diluted nitric acid, the unprotected surface is etched, and a relief surface formed which can be used for printing. *Photo-zincography* is accomplished by first preparing a photograph, then trans-

ferring it to zinc, from which copies can be multiplied as from a lithographic stone; it is based upon the fact that bichromates render gelatin insoluble when a mixture of the two is exposed to the action of light. The paper used is prepared with a solution of bichromate of potassium and gelatin, and exposed together with the negative of a drawing or other design to the light, the outline of the same being thus obtained in insoluble lines. On then covering it with printer's ink and wetting it at the back, the soluble portion swells up, and allows of the removal of the ink from this part, but not from the insoluble lines. A copy of the object photographed is thus produced in ink, which can be easily transferred to zinc. See PHOTO-ENGRAVING.

Zinc-white: a commercial product used largely as a pigment, formerly made by the combustion of metallic zinc and collection of the fumes, but of late years obtained directly from zinc ores by a process which combines the reduction of the zinc from the ore to a metallic vapor, and the subsequent burning of this vapor in the same apparatus. The general plan of the apparatus used consists in a perforated hearth, with a closed ash-pit below, upon which hearth is spread the charge of mixed ore and anthracite coal. The latter is kindled, and air blown in through the ash-pit. The products of combustion, containing an excess of air with vapor of metallic zinc, undergo another combustion after leaving the charge, forming fumes of zinc oxide, which, after cooling, are caught by being forced through very long bags of some textile fabric, through which the gases gradually filter, leaving the finely divided oxide within. Zinc-white is extensively used as a substitute for white lead in painting woodwork. Revised by IRA REMSEN.

Zinder: a fertile district in the northwest corner of the Mohammedan sultanate of Bornu, a little S. of the domain of the Tuareg nomads of the Sahara. Its chief town, Zinder, on the main trade-route through the Northern Sudan, is surrounded with walls and ditches, which also inclose many gardens and orchards. It carries on a considerable trade. Pop. of the town, estimated, 10,000. C. C. A.

Zinkite: a native zinc oxide. It is very rare in Europe, but found in abundance at Franklin Furnace and Sterling Hill, near Ogdensburg, N. J. It is of a deep-red color, occasionally with a yellowish tint; is brittle, and in thin scales is translucent.

Zin'nia [Mod. Lat., named from Dr. J. G. Zinn (1727–59), professor at Göttingen]: a genus of showy American, chiefly Mexican, herbs of the composite family, much cultivated in flower-borders. The finest are varieties of *Z. elegans*, a Mexican plant. *Z. pauciflora* (often called *Z. multiflora*) grows abundantly in parts of the Southern U. S., where it was doubtless introduced from farther south.

Zinzendorf, tsin'tsen-dōrf, NICHOLAS LEWIS, von, Count: leader of the Moravians; b. at Dresden, May 26, 1700. He attended the Pedagogium at Halle under A. H. Francke 1710–16, and against his own inclinations was a law student at Wittenberg 1716–19, devoting two years to travel in order to complete his education. Whithersoever he went he found himself more interested in religious than in the higher social circles that were open to him. From 1721 to 1727 he occupied a civil office in reluctant compliance with the ambitious projects of his relatives. In 1722 he settled a colony of Moravian refugees on the Berthelsdorf estate in Lusatia, which he had purchased. This colony (Herrnhut) became a center of attraction to persons of Pietistic antecedents. This interest growing, in 1727 he fully identified himself with it, and became the great organizer of the Moravian Church. Zinzendorf's original conception was not that of a separate denomination, but a union of all the followers of Christ and advocates of a religion of the heart within the bounds of the various confessions. Hence he continued to claim his loyalty to the unaltered Augsburg Confession and Luther's Catechism, and to affirm that he still remained a Lutheran. Ordained a minister at Tübingen in 1734, he was consecrated a bishop by the Bohemian bishops Jablonsky and Nitschmann in 1737. Banished from Saxony in 1736, he lived in Germany, Holland, England, St. Thomas, Pennsylvania, again in England, various parts of Germany, and in Silesia, everywhere active in preaching the Gospel. While in Pennsylvania (1741–42) his work was around Bethlehem and Germantown as centers. He pressed forward missionary activity among the North American Indians, and aimed at the bringing of the various churches into a union by means of numerous conferences. He acted as pastor of the Lutheran church in Philadelphia, and used the title of inspector-general. The sentence of banishment being removed in 1749, he returned to Herrnhut, where he died May 9, 1760. Zinzendorf's sermons preached in Pennsylvania were published at Büdingen in 1744. His chief claim to literary recognition rests upon his 2,000 hymns, a number of which are in common use in English translations of John Wesley and others. See *Life*, by Spangenberg (8 vols., 1772–75; condensed translation by Samuel Jackson, London, 1838), and *Zinzendorf im Verhältniss z. Philosophie u. Kirchenthum seiner Zeit*, by B. Becker (Leipzig, 1886). For additional literature, see extensive bibliography appended to Becker's article in the Herzog-Plitt-Hauck, *Real-Encyklopädie*. HENRY E. JACOBS.

Zion, or **Sion** [*Zion* is from Heb. *Tsiyōn*, liter., sunny place, sunny mountain; *Sion* = Lat. = Gr. Σίων, from Heb.]: an eminence in Palestine, on which a part of Jerusalem is built. It rises 2,540 feet above the level of the sea. W. and S. it faces the valley of Hinnom with a steep precipice 300 feet high. On the northern slope stands that part of Jerusalem which was called the "city of David" or the "upper city"; hence Jerusalem was often called the "daughter of Zion." See JERUSALEM.

Zipaquirá, thee-păă-kee-raa' (often written *Cipaquirá*): a town of the department of Cundinamarca, Colombia; on a high plain, about 25 miles N. of Bogotá. The name means dwelling of the Zipas, and this was in fact a residence of the Zipas, or ancient kings of the Chibcha Indians. It is now important for its manufactures, and especially for a rich bed of salt found in the vicinity. This is worked by the national Government, and two-thirds of the salt used in Colombia is obtained from it. Beds of coal and iron occur in the same region. Zipaquirá has an active trade, the agricultural products of Cundinamarca and Santander being exchanged here for salt. Pop. about 11,000. H. H. S.

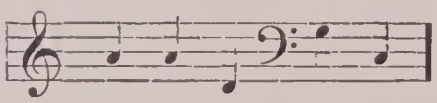
Zircon [= Fr., from Arab. *zarkūn*, cinnabar, vermilion, from Pers. *zargūn*, gold-colored, whence Eng. *jargon* or *jargoon*, a kind of zircon]: a silicate of zirconium, occurring in crystals, generally four-sided prisms terminated by four-sided pyramids, and also in grains of a white, red, brown, yellow, green, or reddish-orange color, the last being sometimes called hyacinth or jacinth. It is found in the sands of rivers of Ceylon, in the sienite of Norway, at Strontian in Argyleshire, Scotland, and in streams of the Croghan Kinshela Mountains in Ireland.

Zirco'nium [Mod. Lat., from Eng. *zircon*]: an element having characters approaching those of a metal, found principally in the mineral called ZIRCON (*q. v.*). Its chemical relations are very close and parallel to the important element *silicon*, which gives to its study great interest. Like silicon and carbon, which also belong to the same natural group, it assumes different allotropic forms, widely varying in their physical characters. The amorphous allotrope of zirconium was obtained in 1824 by Berzelius by a method similar to that which yields amorphous silicon, by the action of an alkaline metal on the *zircofluoride of potassium*, F_6ZrK_2. It assumes a graphite-like luster under the burnisher. It is unchanged by ignition apart from the air, but in air burns to zirconia. *Adamantoid zirconium* was obtained by Troost by fusing potassium zircofluoride in a crucible with an excess of metallic aluminium and dissolving the latter metal out of the fused mass with hydrochloric acid. It resembles metallic antimony in appearance, and is very brittle and hard. It is incombustible except by Hare's blowpipe, and soluble with difficulty in acids, except hydrofluoric and nitro-hydrochloric. *Zirconia* is the anhydrous oxide of zirconium, ZrO_2. It is made from zircon. In many respects zirconium oxide is analogous to silicon dioxide. It forms salts with bases, and these resemble the silicates in composition. Revised by IRA REMSEN.

Zirknitz, tsirk'nits (or **Czirknicz**), **Lake of**: a body of water in a deep valley in Carniola, Austria, between Laibach and Trieste, famous on account of the occasional disappearance of its waters. It is 6 miles long, 3 miles broad, and 15 to 50 feet deep. At intervals—generally in August, though not regularly—its waters are entirely drawn off through a number of fissures in its bottom, and a harvest of hay or even of buckwheat, is gathered in its bed. After the lapse of four or six weeks, or when the wet season sets in, the water pours into the lake from a number of other fissures; but while it generally takes from twenty-two to twenty-five days to empty the lake, it takes often only twenty-four hours to fill it.

Zis'ka, John: leader of the Hussites; b. at Trocznow, Bohemia, in 1360; was educated at the court of Prague, and fought with the Teutonic Knights against the Lithuanians and Poles, in Hungary against the Turks, and on the English side in the wars between England and France. He had embraced the doctrines of Huss, and was conspicuous in the great commotion which was caused by the execution of Huss and Jerome. He was present on the famous July 30, 1419, when the thirteen Roman Catholic magistrates of Prague were thrown out of the windows and massacred. The outburst spread rapidly over the whole country, negotiations from the side of Wenceslas and his successor, Sigismund, failed, and under the leadership of Ziska the Hussites formed a fortified camp on the top of Mt. Tabor. They were in possession of the city of Prague, though not of the castle, and in order to defend it against the Emperor Sigismund, who approached with an army of 30,000 men, Ziska took up a position on the hill of Witkow, just outside the city. He had only 4,000 men, but such was the fanatical enthusiasm with which the Hussites fought that the emperor was unable to remove them, and had to retire with an immense loss after a most sanguinary struggle, July 14, 1420; the hill has since that day borne the name of Ziska Hill. In the autumn of the same year Ziska conquered the castle of Prague, but in the next year became blind. While a boy he had lost one eye, and now, while besieging the castle of Raby, also lost the other. But he continued, nevertheless, to command. Such was his knowledge of his country that from the descriptions of his lieutenants he was able to make his dispositions and conduct the battle. In 1422 the emperor returned with another great army, and on Jan. 18 the battle took place at Deutseh-Brod. The emperor was completely routed, and, unable to raise a third army, he now began to negotiate. He was willing to grant liberty of conscience, to make Ziska governor of Bohemia, etc.; but before the negotiations could be brought to a close Ziska died at Przibislaw, Oct. 11, 1424. He was buried at Czaslau, but in 1623 his tomb was disturbed and his bones removed on an imperial order from Vienna. See Tomek, *Johann Zizka* (1882).

Zither: an instrument of very ancient origin; in its primitive form supposed to be identical with the *psaltery* mentioned in the Bible, and known among the Greeks by the name of *kithara*. In its modern shape it consists of a shallow box, somewhat in the form of a lyre, upon which are strung some thirty strings. These are technically divided into 5 melody-strings, 12 accompaniment-strings, and 13 bass-strings. The melody-strings lie straight across the zither, and are tuned thus:



The two A-strings are of steel, the D of brass, the G of steel wound with silver wire, the C of brass with copper wire. The other strings are partly of gut and partly of silk wound with silver wire, and are placed beside these over a lower cross-piece of wood called the tail-piece. In playing the zither the thumbs of both hands are used, also the first, second, and third fingers. The thumb of the right hand is provided with a partially opened ring with which to strike the melody-strings. This is to the zither what the bow is to the violin. The real home of the zither seems to be Austria and the Tyrol, where it may almost be called a national instrument.

Zittau, tsit'tow (Slav. *Žitava*): the most populous city in the circuit (*Kreishauptmannschaft*) of Bautzen, kingdom of Saxony; close to the Bohemian and Silesian frontier; on the left bank of the Mandau; station of the Saxon Railway and of the Prussian railway Görlitz–Zittau (see map of German Empire, ref. 5–H). The inhabitants are mostly Protestants, and carry on a brisk commerce and extensive industries in cotton, linen, and cloth, which are manufactured in the factories of the town and by the weavers of the surrounding villages. The transit traffic to Bohemia is very considerable. In the suburbs and near villages there are numerous mills of all kinds, iron-foundries, machine-shops, brickworks, and earthenware factories. The great lignite deposits in the neighborhood occupy about 1,000 laborers. Thirty-seven villages, with more than 70,000 inhabitants, mostly weavers, and rich forests extending to Bohemia, belong to the city commune. Zittau has seven churches, a gymnasium (founded 1586), with which is connected a real-school and a commercial school, an important city library with an historical museum, and several industrial schools. Pop. (1890) 25,394.
Hermann Schoenfeld.

Zlatust, zlaă-toost': town; in the government of Ufa, Russia; on the Aï, left tributary of the Ufa (Volga-Kama Basin); in the Ural Mountains; terminus of the Ufa railway-line and starting-point of the Transsiberian line (see map of Russia, ref. 7–I). It is the center of a rich mining district, and manufactures guns, sword-blades, and various articles of steel, which are noted. In the vicinity there are rich iron and gold mines, partly worked by a numerous German colony. There is also a brisk trade in agricultural produce and cattle. Pop. (1891) 21,105. H. S.

Znaim, formerly **Znaym** (Slav. *Znojmo*): town; in Southern Moravia, Austria; a fertile region on a mountain on the left bank of the Thaya (see map of Austria-Hungary, ref. 4–F). It has four suburbs and 14,515 inhabitants (about 90 per cent. Germans), with tanneries and manufactures of leather goods, earthenware, saltpeter, and vinegar, and important trade in grain and fruits. Important buildings are the St. Nicolas church, of Gothic architecture, built in 1348 by Charles IV.; the pagan temple, the oldest architectural monument in Moravia (tenth century); the Thaya viaduct of the Vienna-Teschen Railway; and a monument to the German-American author Charles Sealsfield (Carl Postl). Several higher schools, large hospitals, and barracks are in the city. Pop. of district (1890) 96,785. H. S.

Zoan: See Tanis.

Zoantharia: See Hexacorallia.

Zoar [from Heb. *Tsō'ar*, liter., smallness. Cf. Gen. xix 20]: the only one that was spared of the five "cities of the plain." Originally it was called *Bela* (Heb., "swallowed, devoured," Gen. xiv. 2), Jerome says, because, according to Hebrew tradition, it was destroyed for the third time by an earthquake (*Com. in Isaiam*, xv., 5). The four cities that perished were Sodom, Gomorrah, Admah, and Zeboim.

Zöckler, Otto, Ph. D., D. D.: theologian; b. at Grünberg, Hesse, May 27, 1833; educated at Giessen, Erlangen, and Berlin (1851–56); became privat docent at Giessen (1857); professor extraordinary there 1863; Ordinary Professor of Theology at Greifswald 1866. His numerous writings include commentaries upon Chronicles, Job, Proverbs, Ecclesiastes, Song, and Daniel, in *Lange*: Acts, Galatians, and Thessalonians, and on the Apocrypha in the *Kurzgefasster Kommentar* (1886, *seq.*), edited by him in conjunction with H. L. Strack; and contributions in the *Handbuch der Theologischen Wissenschaften*, which he edits alone. All his works display great industry and extensive information. Besides these may be mentioned *Kritische Geschichte der Askese* (Frankfort-on-the-Main, 1863); *Hieronymus* (1864); *Das Kreuz Christi* (Bielefeld, 1875; Eng. trans., *The Cross of Christ*, London, 1877); *Geschichte der Beziehungen zwischen Theologie und Naturwissenschaft* (2 vols., 1877–79); *Gottes Zeugen im Reich der Natur* (2 vols., 1881); *Biblische und Kirchenhistorische Studien* (5 parts, Munich, 1893). Samuel Macauley Jackson.

Zo'diac [viâ O. Fr., from Lat. *zodi'acus* = Gr. ζωδιακός (sc. κύκλος, circle), circle of animals, zodiac, liter., masc. adj., pertaining to animals, deriv. of ζῴδιον, dimin. of ζῷον, animal]: an imaginary zone or belt in the heavens, extending from 9° N. to 9° S. of the ecliptic, and comprising that region of the heavens within which the apparent motions of the sun, moon, and all the greater planets are confined. It is divided into twelve equal parts, called "signs," which are designated by the names of the constellations Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, and Pisces, which are supposed to have been invented in Egypt, and refer to the division of the seasons and the agriculture of that country. See Sign and Constellation.

Zodi'acal Light: a faint illumination of the sky in the region of the zodiac visible in the evenings of winter and spring after the end of twilight, and in summer and autumn before daybreak in the morning. It can be well seen only when the sky is perfectly clear, and the moon below the horizon. When seen in the evening it appears as a faint column of light, rising from the W. and inclining toward the S., which can sometimes be traced nearly to the meridian. Atmospheric vapors obscure the view of it near the horizon; it attains its greatest visible breadth and brilliancy at an elevation of perhaps 15° or 20°, where it may be as bright as the Milky Way. It differs from the Milky Way, however, in its extremely soft appearance. Under a very clear atmosphere, near the equator, it may sometimes be seen by keen eyes as an arch of light extending all the way across

the heavens, near the ecliptic. Whether the central line of the arch coincides accurately with the ecliptic does not seem to have been well determined. In northern latitudes it always appears N. of the ecliptic, but this may be due in part to the absorption of the light by the atmosphere. Connected with this light is said to be the mysterious phenomenon known as the *Gegenschein*, consisting in a faint glow at that point of the heavens which is directly opposite the sun.

No complete and satisfactory explanation of the zodiacal light has yet been given. The best opinion is that it is caused by a mass of nebulous gases, or finely divided matter, surrounding the sun near the plane of the ecliptic, and extending out a little beyond the earth's orbit. The general aspect of the light shows that its form must be somewhat that of a lens, having the sun in its center. If this view be correct, the illumination is due to reflected sunlight. If such were the case the spectrum of the light should not differ from the solar spectrum except in intensity. The careful observations of Prof. Wright, of Yale, seem to show that such is the case. The phenomenon, however, is one on which there is still a want of accurate observations at elevated stations under the equator. S. NEWCOMB.

Zoe'a [Gr. ζῷον, animal]: a name given to one of the stages in the development of crabs, under the impression that it was an adult. At present the term is used to indicate one of the free-swimming stages, the constant characters of which are a large carapax usually armed with spines projecting from the back, sides, and front; a well-developed abdomen, which is divided into segments, but which lacks appendages, and a usually forked caudal lobe. Under the carapax are seven pairs of appendages, the posterior six segments and the corresponding appendages of the adult cephalothorax being rudimentary or not developed. The zoea varies greatly in size and in the development of the spines, etc., but only in rare instances is it larger than a pea. This stage is usually succeeded by one known as the megalops. J. S. K.

Zoetrope: See STROBOSCOPE and VITASCOPE.

Zola, ÉMILE: novelist; b. at Paris, Apr. 2, 1840; passed his youth in Southern France, but finished his studies at Paris at the Lycée Saint-Louis; became a clerk in the publishing-house of Hachette, using his leisure for writing for the newspapers and composing novels. He showed the character of his talent in the *Contes à Ninon* (1864), *La Confession de Claude* (1865), *Thérèse Raquin* (1867), and *Madeleine Férat* (1868), which exhibit a violent realism marked by a materialistic conception of life, the prominence of the physiological element, the choice of vice and disease as objects of observation, and a brutal frankness, and often a great power of statement. This realism, which he called naturalism, he defended with great acrimony in critical articles collected in the volumes *Mes Haines* (1866); *Le Roman expérimental* (1880); *Documents littéraires* (1881); *Les Romanciers naturalistes* (1881); *Une Campagne* (1882), etc. It was exemplified especially in twenty novels under the general title *Les Rougon-Macquart, histoire naturelle et sociale d'une famille sous le second Empire* (1871–93). Some of these novels have enjoyed a very wide sale and popularity: *L'Assommoir* (1878); *Nana* (1880); *Pot-Bouille* (1882); *Germinal* (1885); *La Terre* (1888); *La Débâcle* (1892). Since the *Rougon-Macquart* series he has published *Lourdes* (1894); *Rome* (1896); *Paris* (1897). In 1898 Zola was tried on a charge of defamation, in connection with the Dreyfus case, and sentenced to be imprisoned for a year and to pay a fine of 3,000 francs.

Zollverein, tsōl'vär-īn [= Germ.; *zoll*, toll, tax + *verein*, union]: a union of the German states, according to which all custom duties along the internal frontiers of the states belonging to the union were abolished, and the revenues proceeding from the custom duties levied along the external frontiers of the union were partitioned among the members according to population. Prussia was the first to propose such a customs union, but at first only the minor states would enter it. By 1834 eighteen states had become members, and others joined from time to time till in the period from 1854 to 1865 all states had entered it except transleithan Austria, the two duchies of Mecklenburg, Liechtenstein, Schleswig-Holstein, and the Hanse towns. It proved eminently beneficial by throwing down vexatious and mischievous barriers to communication, and by reducing the cost of collecting the revenues. Upon the formation of the German empire in 1871, there was no longer any reason for the separate existence of the Zollverein.

Zom'bor, or **Sombor**: royal free town of Hungary, in the Serbian woiwodina; capital of the county of Bács; on a wide plain near the Francis Canal, which connects the Theiss with the Danube, and is a station of the Szegedin-Essegg line of the Hungarian state railway (see map of Austria-Hungary, ref. 8–H). The city has extensive silk manufactures and a large trade in corn and cattle. Pop. (1890) 26,435. Revised by H. SCHOENFELD.

Zona Libre: See TAMAULIPAS.

Zona'ras, IOANNES: historian; b. in Constantinople in the first half of the eleventh century. He was commander of the imperial body-guard and private secretary to Alexius I. Comnenos. In consequence of domestic afflictions he became a monk, and withdrew to Mt. Athos, where he died at the age of eighty-eight or eighty-nine, in 1118. In his retirement he composed many works, some of which still exist, both printed and in manuscript. The most important are his *Chronikon* or *Annales*, a history of the world from the creation to 1118, edited by Du Cange (Paris, 1686) and by Dindorf (Leipzig, 1868–75), and his *Lexikon*, edited by Tittman (Leipzig, 1808). E. A. G.

Zoölogical Geography, or **Zoögeography**: that branch of geography which treats of the distribution of animals and of the division of the earth's surface into areas characterized by the presence of distinctive species or groups of animals. These associations of species are termed faunas. While it is not to be expected, nor necessary, that all the species occurring within a given area should be restricted to it alone, a sufficient number of species, genera, or families, should be peculiar to the region to give it a distinctive character. While a fauna is the sum total of animal life in any given division, all animals are not of the same importance in the definition of zoölogical regions, or life areas, as they have aptly been called. Fresh-water fishes have been regarded as among the best animals for this purpose, because, in the nature of things, they are less liable to be dispersed by accidental causes. It may be said against the choice of fresh-water fishes that they define great drainage areas rather than zoölogical areas, and also that it is becoming more and more evident that terrestrial and aquatic life must be studied independently, as their areas of distribution are not the same.

Mammals have been accorded first rank in determining faunal areas of terrestrial life, and zoögeographers have relied largely upon them to characterize their divisions, checking them by other animals.

The causes of the distribution of animals are many, the prime factor being, of course, the past geological history of the globe, including, as it does, those changes which have affected the continuity, extent, and elevation of former and existing land areas. The question of continuity is most important, since it practically controls the dispersal of land animals over large areas—a fact well illustrated by New Zealand and the islands of Polynesia, where there are no indigenous mammals save bats, whose power of flight has caused them to be very widely distributed. Next in order comes temperature, which is the most important controlling agent in the distribution of life over existing areas. Its effect has long been recognized, and it is very obvious that it acts directly by limiting the range of many animals, and indirectly by its influence on vegetation.

That temperature acts in other and more subtle ways than these has long been acknowledged, especially by botanists, but no satisfactory explanation has been offered until recently, when Dr. Merriam enunciated two principal "laws of temperature control" for the northern hemisphere. These, deduced from a careful study of the fauna of North America, are as follows: "The northward distribution of animals and plants is determined by the total quantity of heat, the sum of effective temperatures. The southward distribution of species . . . is determined by the mean temperature of the hottest part of the year."

After temperature come other climatic factors, especially humidity, physical characters, contour and configuration of the land, all of which have a greater or less effect on the distribution of animals.

Humboldt and Buffon may be credited with having laid the foundations of zoögeography, for while other writers had remarked certain peculiarities of distribution, they were the first to make any general deductions on the subject. Humboldt drew attention to the effects of heat and cold on the dispersal of animals, and mapped out zones of animal life. Buffon knew "that the inhabitants of the

tropical and southern portions of the Old and New Worlds were entirely different from each other; that those of the northern portions of the two were to a considerable extent identical; and that the confluence of the two was most apparent toward the proximate portions of America and Asia." Although Buffon recognized these facts, Swainson was perhaps the first to divide the earth into zoölogical regions, proposing five "ranges," practically corresponding to the main continental masses. Since his time various divisions have been proposed, authorities differing very considerably, not only in respect to the number and importance of the various zoölogical regions, but in the matter of their boundaries, although a comparison will show certain general agreements in regard to many of the principal divisions. These differences are partly due to a lack of positive knowledge respecting the actual distribution of animals, and partly to the class or to the combinations of animals selected to define the regions, there being a natural tendency on the part of each zoögeographer to consider as distinctive those groups of animals to which he has paid the most attention. The difficulty of establishing zoölogical regions is enhanced by the fact that their boundaries are not sharply defined, since there will be more or less overlapping of species, forming what have been termed transitional zones.

Among the more important contributions to zoögeography are those of Sclater, Wallace, Allen, and Gill. The first, basing his divisions on birds, makes six regions, which have been widely accepted by European zoölogists and were adopted by Wallace, who divided them into sub-regions.

Dr. Allen's system differs radically from those of Sclater and Wallace in that he insists on the distribution of life in circumpolar zones "which conform with the climate zones, though not always with the parallels of the geographer." He also carries his subdivisions a step further, recognizing three grades of zoölogical regions, termed in the order of their importance realms, regions, and provinces. The realms are eight in number: 1. The Arctic, including that part of the globe N. of the isotherm of 32° F., a boundary which is practically coincident with the northern limit of trees. 2. North temperate. This extends southward in North America to the isotherm of 68° or between 68° and 70° F. This line begins on the Atlantic coast just below the northern boundary of Florida, and runs W. along the Gulf coast to Southern Texas and thence to the Pacific, following approximately the Mexican border. In the Old World the southern boundary of the north temperate realm is pretty nearly the same as that of the Palæarctic region of other writers. In both hemispheres there is a considerable tract of debatable territory. 3. American tropical realm, bounded on the N. and S. by the isotherms of 70° F. The southern boundary leaves the Atlantic coast about lat. 30° S. and bends to the N. until it nearly or quite reaches the tropic of Capricorn in the northeastern corner of the Argentine Republic; thence it turns southward and runs to the base of the Andes, follows them N. to Ecuador, and crosses, bending southward again so as to include a strip of Northern Peru. This very nearly coincides with the southern boundary of the Brazilian region of Wallace. 4. South American temperate realm. This includes all South America and the adjacent islands below the line just described. 5. Indo-African realm, including all Africa S. of a strip along the Mediterranean, and intertropical Asia, including the adjacent islands S. to New Guinea and W. to the Moluccas. 6. Australian realm, comprising Australia, Tasmania, New Zealand, New Guinea, and the Moluccas and Polynesia. 7. Lemurian realm, consisting only of Madagascar and the Mascarene islands. 8. Antarctic realm, mainly oceanic, but comprising also Tierra del Fuego and the Falkland islands.

The following arrangement is in the main that of Wallace, but certain emendations have been made by Dr. Gill, notably the recognition of the temperate South American, New Zealand, and Polynesian regions. The number and boundaries of these divisions will undoubtedly need to be modified as we obtain a better knowledge of the distribution of animals.

I. *The North American or Nearctic realm* embraces North America from its northern boundaries, where it is fused into the European, southward into Northern Mexico, projecting into that country to a considerable distance, and ceasing near the southwestern borders of the U. S. on the lowlands. It has representatives of 26 families and about 750 species of mammals, exclusive of the marine types; 60 families and about 760 species of birds; 25 families and about 250 species of reptiles; 14 families and about 100 species of amphibians; 17 families and about 650 species of fresh-water fishes; and 1 family and 6 or 7 species of marsipobranchiates. Of these several are peculiar to the region.

The realm has been variously subdivided into sub-regions by different authors, notably Agassiz, Baird, Verrill, Allen, Cope, and Merriam, each of whom has based his divisions primarily upon special classes, though availing himself of his knowledge of other vertebrates. The division made by Dr. Merriam is based on a larger amount of material than was available to other writers, as well as on a better knowledge of the laws of distribution. These regions are founded on the distribution of plants as well as of animals, and are three in number:

1. The *Boreal region* extends obliquely across the entire continent from New England and Newfoundland to Alaska and British Columbia, and from about lat. 45° N. to the Polar Sea, conforming in general direction to the trend of the northern shores of the continent. It recedes to about lat. 54° on the plains of the Saskatchewan, and gives off three long arms or chains of islands, which reach far south along the three great mountain systems of the U. S. Twenty genera of mammals are peculiar to this region, or do not extend beyond the transition zone which lies between it and the next division.

2. The *Austral region* covers nearly the whole of the U. S., except the mountains, and reaches northward considerably beyond the boundary on the Great Plains and Great Basin. It is invaded from the N. by the three boreal intrusions mentioned above. To the southward it occupies the great interior basin of Mexico and extends into the tropics along the highlands of the interior. It covers also the peninsula of Lower California, the southern border of which seems tinged with a tropical fauna. Twenty genera of mammals are confined to the austral region. This region is divided by temperature into three transcontinental zones, named transition, and upper and lower austral, and these in turn are subdivided into arid and humid divisions, the most important of which are the arid lower Sonoran, and humid austro-riparian, which together make up the lower austral zone.

3. The *Tropical region*, which occupies the remainder of North America, reaches the U. S. at two points—Florida and Texas. In the former it exists as a narrow belt encircling the southern half of the peninsula from Cape Malabar on the E. to Tampa Bay on the W. In Texas it crosses the lower Rio Grande from Mexico and extends N. to the neighborhood of the Nueces river. In Western Mexico the tropical region reaches Mazatlan. Fifty-three genera of mammals, the majority bats, are exclusively tropical.

II. *The European or Palæarctic realm* is the largest of all, and embraces the entire northern portion of the Old World. Its southern limits nearly coincide with the tropic of Cancer in the lowlands, and its isotherm projected therefrom in the more rugged countries. In Africa it extends into the Desert of Sahara, and in Asia it is limited by the Himalaya Mountains and their spurs. It possesses members of 31 families of terrestrial mammals, 55 of birds (according to Wallace), 25 of reptiles, 9 of amphibians (according to Günther), and 16 of fresh-water fishes. None of these families, however, are continuous over the entire area and at the same time peculiar to it. According to Wallace, there are four regions, or "sub-regions," which he contends are "in the present state of our knowledge at once the most natural and the only practicable ones." These are (1) the European, (2) the Mediterranean, (3) the Siberian, and (4) the Manchurian.

1. The European region coincides with the continent of Europe and its outlying islands northward, but is limited southward by the Pyrenees and the Alps, the Balkans, the Black Sea, and the Caucasus range. A few genera of vertebrates are peculiar to the region, among which are those including the chamois and the desman.

2. The Mediterranean region includes the countries bounded on the N. by the Pyrenees, the Alps, and the Caucasus Mountains, and on the S. by the great desert of Africa; it also embraces Asia Minor, Persia, and part of Afghanistan, as well as the northern part of Arabia. It is the richest of all the European regions in the number of species, and herein forms of North and South Europe meet on common ground, and a few African types have wandered into it. It has been subdivided into (*a*) "the Mediterranean sub-region" and (*b*) "the Persian sub-region."

3. The Siberian region includes the whole of Northern Asia from the Arctic Ocean southward to the borders of Persia and Afghanistan, the Himalaya Mountains, Northern China, and the Amoy river. A number of peculiar genera are present, but these are quite limited in their range, and none extends over the entire area. It is divisible into (*a*) "the Siberian sub-region" and (*b*) "the Tartarian sub-region."

4. The Manchurian region includes Manchuria, as well as the Chinese empire and the Japanese islands, and is characterized by quite a large number of peculiar species of the several classes of vertebrates, which, however, are mostly quite limited in their distribution, and few, if any, extend over even the greater part of the territory. It has been differentiated into (*a*) "the Manchurian sub-region" and (*b*) "the Japanese sub-region."

III. *The Indian or Oriental realm* is of less extent than either of the two preceding ones, but is nevertheless richer than either in the number of species. It extends from the Himalayan range southward to the Indian Ocean, and toward the southeast is limited by the narrow but deep strait which intervenes between Celebes island and its dependencies on the S. and Borneo on the N., and between the islands of Lumbok and Sumbawa on the one hand and Bali and Java on the other; it thus includes the peninsulas of Hither and Farther India and the Indo-Malayan Archipelago and Philippine islands. In it are found 33 families of terrestrial mammals, 71 families of birds, 25 families of reptiles, 9 of amphibians, and 15 of fresh-water fishes. Of these, 12 are peculiar. Four subdivisions are admitted by Wallace, but these will probably need revision. They are as follows:

1. The first or Hindustan region includes the Indian Peninsula from the Himalayas on the N. to the delta of the Ganges and its approximate isotherm on the S.; "and it probably reaches to about Kashmir in the N. W., and perhaps to the valley of the Indus farther S.; but the great desert tract to the E. of the Indus forms a transition to the south Palæarctic sub-region." Its zoölogical peculiarities consist rather in the development of the types than in the exclusive presence of any one.

2. The Ceylonese region—so called because its characteristics are exhibited in the highest degree in the island of Ceylon—includes not only that island, but also the southern portion of the Indian Peninsula to the confines of the first, or Hindustan, region. According to Wallace, "the main features of this division are—the appearance of numerous animals allied to forms only found again in the Himalayas or in the Malayan sub-region, the possession of several peculiar generic types, and an unusual number of peculiar species."

3. The Indo-Chinese or Himalayan region includes the peninsula of Farther India and Southern China, and extends from the Himalayas in the N. southward to the Malaccan peninsula. "Taking this sub-region as a whole," says Wallace, "we find it to be characterized by 3 genera of Mammalia [*Urva*, *Arctonyx*, and *Ælurus*], without counting bats, and 44 genera of land-birds, which are altogether peculiar to it; and by 13 genera of Mammalia and 36 of birds, which it possesses in common with the Malayan sub-region." This region, according to some authors, admits of a further subdivision into three—(*a*) Southern and Central China, (*b*) Burma, Siam, and Cochin, and, as an appendage, (*c*) the Andaman and Nicobar islands.

4. The Indo-Malayan region includes all the islands of the Indo-Malayan Archipelago and the Philippine islands, as well as the Malayan Peninsula. The region is capable of subdivision into several others; Sclater, e. g., has distinguished (*a*) the Malay Peninsula, (*b*) the Indian islands, and (*c*) the Philippine Archipelago. The last is remarkable for the exuberant development of the terrestrial gasteropods.

The Andaman and Nicobar islands have been combined by some naturalists, as already indicated, with the Indo-Chinese region, but by Wallace have been referred, one (the Andamans) to the Indo-Chinese, and the other (the Nicobars) to the Indo-Malayan.

IV. *The African or Ethiopian realm*, as the name indicates, includes the greater part of the African continent, but not all, it being limited on the N. by the Desert of Sahara, although on all other sides bounded by the ocean; but it also comprises, according to most recent authors, the island of Madagascar and the Mascarenes, as well as the peninsula of Arabia. It is distinguished especially in that it possesses the highest types, after man, of the order Primates, these being in all respects the most anthropoid. This region is also further distinguished by the restriction to it of as many as 9 isolated families of mammals. The most marked, however, are the fishes, of which there are 14 families; of these, five are peculiar. This realm, like all the others, has been subdivided by Wallace into four regions, or, as he designates them, "sub-regions"—viz. (*a*) the East African, (*b*) the West African, (*c*) the South African, and (*d*) the Malagasy.

1. The East African sub-region, or that of Central or East Africa, includes "all the open country of tropical Africa S. of the Sahara, as well as an undefined southern margin of that great desert." It embraces Nubia and the country toward the S., as well as the entire width of the continent between about the 10th degree of S. lat. and the tropic of Capricorn. It is mostly distinguished by negative characters in contrast with the others.

2. The West African region comprises the western half of the continent at its greatest width, and is bounded on the N. by the Desert of Sahara, and on the E. and S. by the East African region, its southern bounds being nearly coincident, toward the coast, with the river Congo, but further inland with about the 10th degree of S. lat. Among the characteristic animals of the region are the gorilla, the chimpanzee, and two genera of *Lemuridæ* (*Perodicticus* and *Arctocebus*), constituting a peculiar section of the family Lemuridæ.

3. The South African region embraces the southern portion of the continent, and its limits toward the N. are nearly coequal with the tropic of Capricorn, except along and near the eastern coast, where it extends northward to the vicinity of Mozambique; on all other sides it is bounded by the ocean. To this region, so far as known, are limited several of the forms that are peculiar to Africa—viz. the *Protelidæ*, the *Chrysochloridæ*, and the *Orycteropodidæ*. A large number of genera in various classes of animals are also peculiar to it.

4. The Malagasy region comprises the island of Madagascar, as well as the islands of Bourbon, Mauritius, Rodriguez, and the Seychelles. These, however, exhibit remarkable differences among themselves. (*a*) Madagascar is distinguished by the development of several peculiar types of mammals—e. g. *Daubentoniidæ*, *Cryptoproctidæ*, and *Centetidæ*;* birds and invertebrates of remarkable character further specialize it as an independent region. (*b*) The Mascarene islands include all the small ones enumerated, and several of them are remarkable for the large birds provided with imperfect wings which formerly existed on them, but which through the agency of man have now become extinct.

V. *The South American or Neotropical realm* extends from the N. near the northern boundaries of Mexico in the lowlands, and lower down in the highlands, to the irregular line which marks the northern boundary of the South American temperate realm and runs from lat. 30° S. on the east coast of South America to lat. 5° S. on the west coast. With it are also generally associated the West Indian islands. It has 30 families of mammals, 73 of birds, 35 of reptiles, 16 of amphibians, and 17 of fresh-water fishes. An unusual proportion of these are peculiar to the region, or nearly so. This realm has been subdivided into four regions.

1. The Mexican or Central American region extends from Northern Mexico near the coast, and from Central Mexico in the highlands, southward to about the Isthmus of Panama. It is distinguished by the intermixture of North and South American types; but quite a large number of species and not a few genera are peculiar to the region.

2. The Antillean, West Indian, or Caribbean region, as it has been variously called, includes most of the islands of the Caribbean Sea. On the whole, the types found on the several islands are most closely related to those of the Mexican region, and there are many species and quite a large number of genera peculiar to it. Undoubtedly the most noteworthy feature of this region is the great development of terrestrial gasteropods: these exhibit an extraordinary range of variation, both specific and generic. The larger islands (Cuba, Haiti, and Jamaica) are especially remarkable for the manifestation of this form of animal life. The region is susceptible of subdivision into several others well defined by differences in the combinations of land-shells. Cuba, Jamaica, Haiti, Porto Rico, etc., are all centers of peculiar combinations of species.

3. The Brazilian or Amazonian region embraces the most of tropical America, and its limits are coextensive with the Atlantic Ocean on the N., and generally also on

* An aberrant type of this family (*Solenodontinæ*) is represented in the West Indian islands.

the E., while toward the S. it extends into Uruguay, and toward the W. terminates in the highlands of the Andes. It is extremely rich in representatives of almost every class of terrestrial animals. It is the headquarters of the platyrhine monkeys, the *Caviidæ*, the spiny rats, the ant-eaters, the sloths, the armadillos, and the opossums among the mammals; the toucans, the curassows, the tinamous, and many other families among the birds; and the *Polycentridæ* and *Gymnotidæ* among the fishes; the insects and terrestrial as well as fluviatile mollusks are also as a whole characteristic.

4. The Galapagos region includes the archipelago so named, with about fifteen islands situated on either side of the equator and distant about 600 miles westward from South America. Perhaps it is properly a mere faunal district of the Chilian region, and as such Wallace has considered it.

VI. *The South American temperate realm* coincides very nearly with Wallace's Chilian sub-region, its northern limit on the Atlantic coast being near the 30th parallel. On leaving the Atlantic coast, the northern boundary passes obliquely northwestward, rising in the region of the Chaco Desert to, or possibly a little beyond, the tropic of Capricorn. Again descending to about the 25th parallel, it turns abruptly northward and eastward, along the eastern border of the Andean chain, nearly to the 5th degree of S. lat., near which point it strikes the Pacific coast. It thus embraces a large part of the great Andean plateau, with the neighboring coast region to the westward, nearly all the La Plata plains, and the region thence southward to Tierra del Fuego, which belongs also to this realm.

Within its limits occur representatives of several peculiar groups; there are 18 families of terrestrial mammals, 2 of which (the *Chinchillidæ* and *Chlamydophoridæ*) are almost confined to it; 42 families of birds, 3 of which (*Chionididæ*, *Thinocoridæ*, *and Rheidæ*) hardly occur farther N.; 15 families of reptiles; 11 families of amphibians; 5 families of fishes, two of which are shared with New Zealand and Tasmania, and scarcely extend into tropical America; and 1 family of Myzonts, also shared with New Zealand and Tasmania.

VII. *The Australian realm* is of all the most distinctly defined by its fauna. As here limited, it comprises Australia and the immediately outlying islands and the Austro-Malayan Archipelago; it is limited northward by Wallace's line or strait, which separates Lombok from Bali and Celebes from Borneo, including Papua or New Guinea and the Solomon islands to the eastward, and southward embraces Tasmania or Van Diemen's Land. It is especially distinguished by its numerous marsupial mammals, and by the almost complete restriction of the class to representatives of that order; the monotremes are also characteristic of the realm, and entirely confined to it. The class of birds likewise has a number of very characteristic types. The reptiles and amphibians are perhaps less noteworthy, although they present some interesting features of detail. The fresh-water fishes are, however, especially remarkable; while many of what may be called marine families are represented by fluviatile species, there are several that are peculiar to it or found elsewhere only in South America. Among the former is the family *Ceratodontidæ*, which in former geological epochs was extensively represented in other parts of the world, but is now peculiar to Australia. The articulates and mollusks also afford a large number of characteristic forms. The primary subdivisions of the realm are two:

1. The Australian region includes the continent of Australia and the island of Tasmania, as well as several smaller ones near the coast. This is especially the home of the existing types of marsupials, and all the surviving families, with the exception of *Didelphididæ*, are here best exemplified, and several of them are peculiar. To this region also the family *Ornithorhynchidæ* of the monotremes is restricted.

2. The Austro-Malayan or Papuan region includes the island of Papua or New Guinea, and likewise Celebes and the multitudinous islands lying toward the S. and between it and Papua, as well as the Solomon islands. Among the mammals there is one species of the genus *Sus* known, and one species of *Muridæ*, but all the others belong to the orders of marsupials and monotremes. Among the birds the most noteworthy forms are those of the family *Paradiseidæ*, which are developed to the greatest extent in New Guinea.

Both of the above-specified regions of the Australian realm, but especially the Papuan one, are susceptible of subdivision into well-marked faunal districts; but for information respecting these reference must be made to Wallace's work, as well as to memoirs by Australian and other naturalists.

VIII. *The New Zealand* or *Ornithogean realm* comprises New Zealand only. It has 21 peculiar genera of birds, including the remarkable apteryx, which is by many considered as the type of an order. Moreover, the moas (*Dinornithidæ*) are only recently extinct, and these were restricted to New Zealand. Here also is found the only surviving genus, *Sphenodon* or *Hatteria*, of the order *Rhychocephalia*, a group of reptiles whose fossil remains are widely distributed.

IX. *The Polynesian realm* includes all the islands of the tropical Pacific E. of New Guinea and the few small islands belonging to it. It is very largely distinguished by its negative characters, indigenous mammals being all but absent; there are something like 50 genera and 150 species of birds, including a considerable number of fruit pigeons and small parrots; and the gasteropod fauna is rather characteristic. This realm may perhaps be best considered as provisional, and its exact limits or relations to be determined in the future.

While much has been done in determining the zoölogical regions of the land, comparatively little has been done with those of the sea, because the data are much more meager, and the difficulties in the way of plotting the boundaries of the regions are much greater in the latter case than in the former. As stated by Dr. Gill, there is no relation between the marine faunas and those of the land, for while the geological changes which have affected the elevation of the land have to some extent influenced the character of the marine faunas, yet the two faunas have developed independently of each other. Prof. Dana, so early as 1853, divided marine life into three zones, these being subdivided into nine "regions" limited by isocrymes, or lines connecting points at which the surface temperature averaged the same "for the coldest consecutive thirty days of the year." Prof. Dana's arrangement was as follows:

I. Torrid or Coral Reef Zone.

Regions.	Isocrymal or temperature limits.
Supertorrid (Equatorial).....	80° to 80° F.
Torrid (North and South).....	80° to 74°
Sub-torrid (North and South).....	74° to 68°

II. Temperate Zone.

Warm Temperate (North and South).	68° to 62° F.
Temperate (North and South).....	62° to 56°
Sub-temperate (North and South)....	56° to 50°
Cold Temperate (North and South)..	50° to 44°
Sub-frigid (North and South).....	44° to 35°

III. Frigid Zone.

Frigid (North and South).....	35° to 26° F.

Three great divisions or "kingdoms" were admitted: "the American or Occidental, including East and West America; the Africo-European, including the coasts of Europe and Western Africa; and the Oriental, including the coasts of Eastern Africa, East Indies, Eastern and Southern Asia, and the Pacific. Besides these, there are the Arctic or Antarctic kingdoms, including the coasts of the frigid zones, and in some places, as Fuegia, those of the extreme temperate zone."

Dr. Gunther in 1880, treating of marine fishes, divided them into three categories—shore, pelagic, and deep-sea fishes. The distribution of the last two groups was not touched upon, but the shore fishes were distributed in zones, and the zones divided into districts, thus: I. The Arctic Ocean; II. The Northern Temperate Zone, subdivided into (A) the Temperate North Atlantic, comprising British, Mediterranean, and North American districts, and (B) the Temperate North Pacific, comprising Kamchatkan, Japanese, and Californian districts; III. The Equatorial Zone, subdivided into (A) the Tropical Atlantic, (B) the Tropical Indo-Pacific, and (C) the Pacific Coast of Tropical America, the last named comprising three districts—Central American, Galapagos, and Peruvian; IV. The Southern Temperate Zone, comprising four districts—Cape of Good Hope, South Australian, Chilian, and Patagonian; V. The Antarctic Ocean.

Dr. Gill in 1883 considered that the primary marine regions, or realms, were five in number: (1) The Arctalian, (2) the Pararctalian, (3) the Tropicalian, (4) the Notalian, and (5) the Antarctalian. The Arctalian or Arctic realm comprises the northern seas, extending southward approximately to the isocryme of 44° F., or about to Cape Cod on the eastern coast of North America and the Straits of Juan de Fuca on the west, but these boundaries are said to be provisional. The Pararctalian or North Temperate realm includes the various coast-lines between the isocrymes of 44° and 68°, the latter being the northern limit of reef-growing corals. The Tropicalian realm is the same as Dana's Torrid Zone, including the seas between the isocrymes of 68° N. and S. The Notalian or South Temperate realm extends from the isocrymes of 68° to 44° S. While differing from the Pararctalian there are nevertheless a number of genera common to the two which are absent from the intervening Tropicalian realm. The Antarctalian or Antarctic realm covers the antipodal ocean up to the isocryme of 44°, the only continental area included being part of Patagonia, from the Rio Negro on the east coast to lat. 50·5° on the west.

All the deep-sea fishes were relegated to a Bassalian realm with the qualification that the data on which it was based were insufficient, and that its limits would probably need to be better defined in the future. The statement was, however, made that "one of the characteristic features of the Bassalian animals appears to be their wide dispersion and range, . . . and they appear to be restricted less by latitude and longitude than by bathymetrical influences."

Subsequently to this came the publication of the Challenger *Reports* and the unsurpassed deep-sea work of the U. S. steamer Albatross, which, together with other less pretentious researches, furnished Dr. Goode with the material for papers presented by him in 1895. In these papers Dr. Goode shows that the ideas that the fauna of the deep sea is characterized by its uniformity and that the distribution is in horizontal zones are incorrect, and that instead of being limited by temperature a number of deep-sea faunal regions can be characterized as bounded in some instances by submarine plateaus. These regions are eleven in number, and the best defined of them are distinguished by the possession of not less than 25 per cent. of peculiar genera and 33 per cent. of peculiar species.

They are (1) the Boreal Atlantic; (2) Eastern Atlantic, or Lusitanian, with a Mediterranean sub-region; (3) Northwestern Atlantic, or Virginian, with a Caribbeo-Mexican sub-region; (4) Southwestern Atlantic, or Brazilian; (5) Boreal Pacific, or Aleutian; (6) Eastern Pacific, or Galapagean; (7) Northwestern Pacific, or Japanese; (8) Polynesian; (9) New Zealandian; (10) Antarctic; (11) Indian.

The fishes inhabiting the open ocean are termed oceanic fishes to distinguish them from the shore-frequenting or littoral species. They are divided into two general groups: 1. Pelagic fishes, or those which live near the surface; many of these descend to considerable depths and are called bathy-pelagic. 2. Bathybial fishes, or those which frequent the great depths of the ocean and are not found at less than 1,000 feet below the surface. A large number of species dwell at or near the bottom between the littoral and bathybial zones, often descending to considerable depths; they are mostly allied to littoral forms which have made their way down the continental slopes, and are termed hemi-bathybial or semi-littoral. They constitute more than half the inhabitants of the eleven bathybial regions, and many of the peculiarities of these divisions are due to the contingent of hemi-bathybial fishes, which in turn are related to those of the adjacent coast faunas.

It is still a moot question whether the intermediate depths of the ocean are or are not inhabited by fishes or invertebrates. Prof. Haeckel, of Jena, assuming that life occurs at all depths, has proposed an elaborate scheme of nomenclature for the various deeps and for the animals assumed to dwell in them. Other naturalists, the most prominent among them being Alexander Agassiz and Victor Hensen, maintain, on the other hand, that life is limited to the strata directly adjacent to the surface and to the ocean bottom, and that the region between is practically lifeless, although no doubt many forms pass through these depths, at least from below upward, while many bathybial forms reside at the surface during the early stage of their lives.

The Plankton expeditions of the Germans and French, and the elaborate experiments of Prof. Agassiz with his trap-nets, tend to confirm these views, and indicate that pelagic life is normally confined to the upper strata of the ocean, and that many forms which have been brought up in deep-sea nets and supposed to have come from great depths were really taken near the surface, and that pelagic life in the open ocean is confined, at most, to depths of 200 to 300 fathoms.

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Zoöl'ogy [Gr. ζῷον, animal + λόγος, discourse, reason]: that part of biology which relates to animal life; the science which treats of the structure, development, classification, distribution, habits, and derivation of animals. Zoölogy properly includes the study of extinct animals as well as those now living on the earth, but the former branch of the science is considered by itself under the title PALEONTOLOGY (*q. v.*).

HISTORY.—The science of zoölogy begins with Aristotle (B. C. 384–322), whose works include the comparative anatomy of animals, together with the first-known classification. He mentions about 500 species of animals, and had dissected, studied, and described many forms which were not re-examined until recent times. His interest in the science was pre-eminently anatomical, although his influence at the Renaissance was chiefly systematic. No other ancient writer contributed much to the advancement of the science. The work of Pliny (23–79 A. D.) is distinguished by wide and entirely uncritical knowledge. It is a collection of mingled facts and fables about animals. Other ancient writers treated of human anatomy rather than zoölogy.

During the earlier Middle Ages no interest was shown in zoölogy for its own sake. In the fourteenth century a work appeared in various languages entitled *Physiologus*, treating chiefly of the natural history of Bible animals. It described about seventy species, including among them fabulous forms like the griffin and the phœnix.

The Arabian naturalists of the twelfth and thirteenth centuries translated Aristotle, and in some degree introduced him to the knowledge of the Western world. Among these may be mentioned Abd-el-Latif, Avicenna, Abd-ul-Faraj, and, in less degree, Averroes. At the revival of learning, zoölogy recommenced by the translation and commentary on Aristotle by Albertus Magnus (1193–1280). No advance in the science, however, was made either by him or by his contemporaries, whose interest did not lie in the direction of scientific study.

The zoölogy of modern times is divided into four periods —that of the encyclopædists, that of Linnæus, that of Cuvier, and that of Darwin.

The Encyclopædists, 1500–1750.—The first new impetus to the study of zoölogy was given by the discovery of the Indies, East and West, and the animals which these discoveries brought to the notice of the Europeans. In the latter part of the sixteenth century A. Gesner published, in his *Historia Animalium*, the work from which modern zoölogy

may be dated. It described all the animals known to his time, with illustrations, many of them given to the world for the first time. The work of U. Aldrovandi is of a similar character, less critical, but still of great value in extending the knowledge of the new animals discovered in Asia and America. The Englishman Wotton (1492–1555), by his translation of Aristotle, revived the Aristotelian zoölogy, stripped of mediæval fables, but his work had little influence as compared with those already cited. It began, however, the systematic work which led through Ray to Linnæus.

The Linnæan Period, 1750–1800.—These encyclopædic works gave the world that knowledge of facts which must precede the scientific handling of a subject, and prepared the way for Linnæus, with whom modern scientific zoölogy and botany began. To the forces aiding in the accumulation of these facts must also be added the development of human anatomy and of microscopy in the fifteenth and sixteenth centuries.

Linnæus (1707–78) first constructed a complete system in which all animals were to be enrolled. It was superficially constructed, indeed it was largely artificial, and yet the very fact of its completeness aided in making his work the point of departure for scientific zoölogy. His method was equally important. He introduced the binary system of nomenclature, which, although apparently a small thing, was in reality of the first importance in contributing to the clarification of knowledge in zoölogy, and he introduced also the diagnosis, as distinguished from the description, of the animal. In Linnæus's method every animal was to receive its proper names—generic and specific—and was to be briefly characterized in terms which should distinguish it from all other members of the same genus, and each genus and other higher group was to be similarly characterized. In order properly to characterize a new animal, it had to be examined in all particulars, so as to find its diagnostic characters, and to determine its place in the system; and this study led to increasing knowledge of the characters of animals, and made necessary a continual revision and correction of the system itself as knowledge enlarged. With the work of Linnæus the conception of the animal kingdom was developed for the first time, and zoölogy became an account of this kingdom rather than a mere description of individual animals. Linnæus's *Systema Naturæ* was published about the middle of the eighteenth century, and the next half century was mainly occupied with applying to the animal kingdom the principles which he had established, and widening the knowledge of the animal kingdom on lines which he had laid down. Among the distinguished zoölogists of this period are Buffon, Bonnet, Fabricius, O. F. Müller, Lacépède, Trembley, Spallanzani, and C. F. Wolff.

The Cuvierian Period, 1800–60.—Important as were the ideas contributed to zoölogy by Linnæus, they were not without danger to the science. Men forgot that "species" was merely a collective term, and ascribed to it a certain kind of real existence. They looked on the system as the structure into which newly discovered knowledge was to be fitted, not as the constantly changing expression of increasing knowledge. The Linnæan system, too, was especially deficient on the side of the higher classification, and the method included no criteria for grouping animals under the higher categories. A knowledge of comparative anatomy was needed in order to bring into view the points on which higher classification rests.

With the nineteenth century began a new development of zoölogy in the direction of comparative anatomy. The leader in this movement was George Cuvier (1769–1832), who possessed an extraordinary knowledge of the facts of comparative anatomy, based largely upon his own researches, and at the same time was able so to handle these facts as to establish three zoölogical principles of the first importance. The first of these was the law of the correlation of parts—the law that each organism is not a mere aggregate, but forms a complete whole, in which single parts can not be altered without changing all of the others; so that from the presence of certain characters the presence of others may also be inferred. This principal underlay his study of paleontology, which science he started, and his famous reconstructions of fossil animals. The second principle was that of subordination of characters—that certain characters are leading and others subordinate to these. From these he developed his third idea—that of types of structure in the animal kingdom. He conceived that under the principle of subordination of characters animals were built upon certain plans of structure, according to which they might be arranged in great types or branches (*embranchements*). These were four in number—vertebrates, articulates, mollusks, and radiates. The animals in each branch were built on the same plan, and corresponding or homologous parts might be found in them. Animals in different branches were built on different plans, and showed no correspondence of structure, only likeness of function, analogy. Previous to Cuvier's establishment of the type theory the animal kingdom had been divided into classes of very unequal value, based on complexity of structure, and the idea was generally maintained, as by Lamarck, that the animal kingdom formed a series ranging from the highest and most complex to the lowest and most simple. The type theory was vigorously opposed by É. Geoffroy Saint-Hilaire, but unsuccessfully, and it dominated the zoölogy of the next half century.

The first half of the nineteenth century was devoted to working out and enlarging the ideas in anatomy and classification given to the zoölogical world by Cuvier, and a host of students developed the science both on the systematic side and in comparative anatomy. Embryology, founded by C. F. Wolff in the middle of the eighteenth century, began its real life with the work of Pander, von Baer (1792–1876), and other embryologists of the first part of the century, whose embryological work aided greatly to confirm the type theory as established by Cuvier. Histology originated with Bichat in the first years of the century. Of the host of distinguished men of this period only a very few may be named, an account of whom may be found under their respective names: Johannes Müller, perhaps the most influential comparative anatomist next to Cuvier, Ehrenberg, d'Orbigny, von Siebold, who corrected the Cuvierian types by the separation of the Protozoa, and Leuckart, who still further separated the Cuvierian types into seven divisions, substantially as indicated in the article ANATOMY, COMPARATIVE. In comparative anatomy no name is more distinguished than that of Richard Owen. In the U. S. the greatest name of this period is that of James D. Dana.

The Darwinian Period, 1860 to the Present.—The publication of *The Origin of Species* in 1859 by Charles Darwin worked a more rapid and complete change in zoölogy than in any other science—even the sister science of botany—(see EVOLUTION and DARWINISM), and under the stimulus afforded by the evolutionary conception of the animal kingdom, zoölogy has developed with great rapidity, has specialized in many different directions, and has claimed the labors of a host of men of the first ability. It is only possible here to sketch the directions in which zoölogy has moved, without attempting to name even the most important works and scientists.

The idea of descent gave for the first time a point from which all branches of the science could be viewed. The facts of systematic zoölogy, comparative anatomy, embryology, and the biological relations of animals could now be handled together for a common end, and their own interrelations could now be seen. As a result, all the older departments of the science have been developed with marvelous rapidity, and many new and formerly unsuspected directions of investigation have appeared.

Classification.—The number of species of animals known to science has increased with great rapidity. Linnæus recognized about 6,000 species. In 1830 the number of known species was estimated at 50,000. Thirty years later, in 1860, I. Geoffroy Saint-Hilaire estimated the number at 140,000. In 1875 Pagenstecher gave 300,000 as the number then known. At the present time 400,000 to 500,000 would be a conservative estimate. Good authorities suppose that there are at least 1,000,000 species of insects, including those undescribed as well as those now known. The handling of this vast and rapidly increasing mass of material has called for a corresponding increase in the complexity and perfection of the methods of classification. At this place, however, only the changes in the higher classification can be noticed. As already stated, the type theory of Cuvier as modified by Leuckart and others, was the dominant theory of classification until the acceptance of the theory of evolution. The type theory is still practically dominant, although not interpreted to-day as it was by its adherents in the first half of the nineteenth century. The conception of descent which evolution introduced has not been used successfully as a basis of the wider classification, although many attempts have been made to do so. Our knowledge of the inter-relationships of animals is still so incomplete and the relations are so complex that it has been impossible to

group the larger divisions of the animal kingdom on this basis. It is only in the past few years that there has been any marked tendency to break away from the seven types of animals established more than a half century ago by Leuckart, substantially as given in the article on ANATOMY, COMPARATIVE. The idea of plan of structure has been abandoned, although the name *type* or *branch* is still retained for the primary divisions of the animal kingdom. Recent classifications depart from older ones chiefly in the multiplication of new primary groups and in the redistributing of groups of doubtful affinities. The most important change is the establishment of groups higher in rank than that of type. The most generally accepted division of this sort is that of *series*, under which the animal kingdom is divided into two great groups, the *Protozoa*, or one-celled animals, and the *Metazoa* or many-celled animals. Less generally accepted is the division of *Metazoa* into *Acœlomata* or *Cœlentera* and *Cœlomata*, or *Metazoa* devoid of a body-cavity and those possessing one. The most important modifications of the limits of the types or branches are as follows: (1) The old group *Vermes* has been abandoned and a number of groups have been substituted for it. Perhaps no two high authorities agree as yet in regard to the number, limits, or affinities of these groups. (2) The separation of *Bryozoa* and *Brachiopoda* from *Mollusca*, leaving, however, their affinities in doubt. (3) The sponges are placed in connection with the *Cœlenterata*, either as a group subordinate to that or correlative with it. (4) The division of *Arthropoda* into at least two branches. (5) The union of *Tunicata* and perhaps other groups with the *Vertebrata*.

Sciences relating to the Structure and Development of Animals.—Morphology.—A general account of the morphology of animals is given under ANATOMY, COMPARATIVE, and reference is made here only to the changes in the science accomplished by the introduction of the doctrine of evolution. Comparative anatomy, founded by Cuvier, had at first two aims: first, the description of the structure of animals, and second, the handling of these facts so as to work out the types of structure upon which animals were built. With the abandonment of the type theory this second purpose has been abandoned, and the science has been handled with a view to discovering the affinities between groups of animals, the origin of the structures possessed by the higher animals, and the lines of development by which they have reached their present condition. Carl Gegenbaur, whose anatomical work extends over the whole period from 1860 to the present time, has doubtless contributed more than any other one man to this philosophical handling of the subject.

Histology.—An account of the tissues of animals will be found under the heading HISTOLOGY.

Physiology.—While the study of the physiology of man and the higher animals, especially the mammals, has developed greatly within the last quarter century (see PHYSIOLOGY), the study of the physiology of the lower animals, especially the invertebrates, has been comparatively neglected. The doctrine of evolution, emphasizing the genetic affinities of animals, has diverted attention from the subjects of histology and physiology, which have contributed least to the working out of the questions arising from evolution.

Embryology.—The science of embryology, which had developed very slowly before *The Origin of Species* appeared, rose at once into a place of the first importance on the introduction of the idea of evolution. In the article EMBRYOLOGY, an account is given of the development of the higher vertebrates, particularly the mammals. This field had been partially explored before 1860, although immense additions to our knowledge of embryology have been made since that time. The study of the embryology of the invertebrates, which is not discussed in that article, has been of even greater service in advancing our knowledge of zoölogy. This is especially true of the study of the larval forms of invertebrates, to which reference is made in the several articles on these groups. The nauplius larvæ of the *Crustacea* (see CRUSTACEA), the trochosphere of the worms, the veliger larvæ of the mollusks, and the larvæ of the *Tunicata* (see TUNICATA) have been of the first importance in determining the internal and external relationships of these groups. The results of the study of these developments led to the establishment of the so-called biogenetic law, first stated by Haeckel. This law asserts that the embryology of any group is a recapitulation of the history of its descent, and that from the study of the developmental changes of the individual there can be learned a summary of the developmental history of the group to which it belongs. This law, however, is subject to important modifications, since, first, many features of embryological development have been acquired by the larvæ and do not show the past history of the group to which it belongs; and, second, many stages of development which must have been present in the history of the group are not represented in the development of the individual. While these modifications were recognized by Haeckel, they are undoubtedly given more weight at the present time than formerly, and it is not thought that embryology offers such clear indications of phylogeny as was once believed. Since 1880 the science has developed in other directions, especially in the knowledge of the more minute facts of development, the study of the process of fertilization and of cell division in the egg, and the history and fate of each of the primary parts into which the cell segments. These studies have led in recent years to a rediscussion of the facts and methods of heredity. (See HEREDITY.) In these discussions the Hertwig brothers and Weismann have taken a leading part. Still more recently experimental methods have been introduced into embryology. In these, the egg or young embryo is exposed to changed or abnormal conditions, separated into its primary parts, etc., and the effect of these changes on development is noted. From this work important conclusions have followed as to the powers and capacities of the original cells of which the germ is composed. As leaders in this work the names of Driesch and Roux, in Europe, and of Loeb, Morgan, and Wilson, in the U. S., may be mentioned.

Sciences which deal with the Relation between Animals and their Surroundings.—The science of geographical distribution of animals (see ZOÖLOGICAL GEOGRAPHY) has been entirely remodeled since 1860. Previous to that time the distribution of animals was regarded as a simple matter of fact. It is now interpreted in the light of the possibilities of distribution and the hindrances offered by mountain barriers, seas, etc., and has become an important constituent of zoölogical science. The study of the relations existing between individual animals and their immediate surroundings has led to the development of the doctrine of mimicry and other general questions related with the color of animals. (See EVOLUTION.) The study of variations is a department of zoölogy in which investigation has recently commenced. While the fact of variation has long been known and has been used as a factor in theoretical zoölogy, very little accurate study of the effects of variation has as yet been made. The first systematic work on the subject is that of Bateson.

Animal Biology.—The systematic and morphological sides of zoölogy found their best expression in the museum (see MUSEUM) and in the zoölogical gardens. Of the latter by far the largest is that at London, founded in 1828. In Paris is the Jardin des Plantes, founded in 1794, and in most of the capitals and larger cities of Europe smaller zoölogical gardens are maintained. In the U. S. there are such gardens at New York, at Philadelphia, and at Cincinnati, and less important ones elsewhere. Modern zoölogy has found it necessary to supplement the museum by stations where marine or fresh-water animals can be studied under their natural conditions, and numerous marine zoölogical laboratories or stations have been established since 1870. The oldest and the best known is that at Naples, founded in 1872 by Dr. A. Dohrn and supported mainly by the German Government. This has been followed by laboratories in all the chief countries of Europe. On the Adriatic there is the station of the University of Vienna at Trieste, on the Mediterranean the French Government station at Banyuls and one at Marseilles, and the Russian station at Villefranche. There is a station on the Atlantic in France, at Roscoff, under the direction of Prof. Lacaze-Duthiers. In Great Britain the chief station is at Plymouth, opened in 1888. There are others less important at Liverpool and at St. Andrews, near Edinburgh. In Holland there is a station at the Helder, opened in 1890. In Germany the only station is that of the laboratory of the University of Kiel. A Government station has recently been established in Heligoland. Germany has also at Plön, in Holstein, the first permanent fresh-water station ever established, although a second is being established at Havana, Ill., by the University of Illinois. Norway has two stations and Sweden has one. Russia has a station at Sebastopol and one on the White Sea near the convent Solvotsky, besides the station on the Mediterranean. Japan has a station at Musaki. In the U. S. the oldest station is the private laboratory of Prof. Alexander

Agassiz at Newport. The Johns Hopkins University has maintained a marine laboratory since 1877, but it has not been permanently located, frequently changing its place of work, although usually on the southern Atlantic coast of the U. S. or in the West Indies. There are marine laboratories also at Woods Holl, Mass., and Cold Spring Harbor, Long Island. The Leland Stanford Junior University maintains a marine laboratory near Monterey, Cal. These, however, are for instruction, both elementary and advanced, as well as for research, and they do not maintain a corps of observers throughout the year.

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E. A. BIRGE.

Zo'öphytes [from Gr. ζῳόφυτον; ζῷον, animal + φυτόν, a plant]: a name formerly in use for the fixed forms of the Cœlenterates. See HYDROIDS, etc.

Zoöpraxiscope: See STROBOSCOPE and VITASCOPE.

Zo'öspores [Gr. ζῷον, animal + σπόρος, seed]: minute naked masses of protoplasm escaped from plant-cells, which move about in the water by means of one or more cilia. On account of their activity they are easily mistaken for animals, which fact has suggested their name. They are common in many of the lower orders of plants, where they serve as reproductive bodies. In most cases each zoöspore is provided with two cilia near one extremity; sometimes, however, there are four, and in some cases there are a great number—e. g. in *Vaucheria* they cover the whole surface.

CHARLES E. BESSEY.

Zorgite: See SELENIUM.

Zorilla [= Span., dimin. of *zorra*, fox]: a name given in Spanish America to certain skunks of the genus *Conepatus*, but transferred both as a popular and generic name to certain skunk-like *Mustetidæ* of South Africa, for a long time confounded with the South American skunks. The typical species, *Zovitta striata*, is somewhat smaller than a cat, black, with a white spot on the forehead and each temple, and four white stripes on the back. The bushy tail is black and white.

F. A. L.

Zorndorf, tsōrn'dōrf: village of Prussia, province of Brandenburg; famous for the battle fought here on Aug. 25, 1758, between the Russians under Fermor and the Prussians under Frederick the Great; the Russians were defeated.

Zoroaster, zō-rō-ăs'ter (Gr. Ζωροάστρης, Lat. *Zoroastres*, Pers. *Zardusht*, Avestan *Zarathushtra*): the prophet of ancient Iran, whose teachings are preserved in the AVESTA (*q. v.*). The era at which this religious leader flourished has been open to discussion and controversy. Persian tradition is probably nearest the truth when it claims the sixth century before Christ as the period of his mission, although the writers of classical antiquity vary between B. C. 1000 and B. C. 6000 in giving his date. There is good authority for believing that the district of Atropatene in Western Iran was his native place, but the scene of his preaching and teaching was Bactria in Eastern Iran. King Vishtaspa of Bactria was his religious patron, but the consensus of scholarly opinion is rather against identifying this ruler with Hystaspes, the father of Darius, notwithstanding the identity of the names.

Regarding the life of Zoroaster, there is no doubt that he was an historical personage in spite of numerous legends that have gathered about his name. The tradition, moreover, is probably authentic that he began his ministry at the age of thirty, that he was forty-two when he converted King Vishtaspa, and that when seventy-seven years old he was slain, apparently in a storming of Balkh by the Turanians. He is commonly regarded as a Magian, a reformer of the old Iranian faith, and as the founder of a new creed. Dualism was one of its characteristic tenets (see ORMAZD), a belief in angels and archangels (*yazatas amesha spentas*) and in demons and fiends (*daevas, drujes*) was recognized; the doctrine of a bodily resurrection was taught; the practice of agriculture and husbandry enjoined; and the care of useful animals, as well as keeping pure the fire, water, and earth, was inculcated. The power of Zoroastrianism as the national religion of ancient Persia was first broken by the invasion of Alexander the Great, and although restored under the SASSANIDÆ (*q. v.*), it was overthrown by the rise of Mohammedanism. To-day the faith is professed by about 90,000 PARSEES (*q. v.*). See also PSALMS OF ZOROASTER.

A. V. WILLIAMS JACKSON.

Zorrilla y Moral, thōr-reel'yăa-ee-mō-raal', JOSÉ: poet; b. at Valladolid, Spain, Feb. 21, 1817. After receiving his youthful education in the seminary for nobles at Madrid, he yielded to his father's wish that he should study jurisprudence, and passed two years at the universities of Toledo and Valladolid. Even as a boy, however, he had become an ardent admirer of Sir Walter Scott, Cooper, and Chateaubriand. After holding for a brief time a post in the magistracy at Valladolid, he set out for Madrid (1837). Shortly after his arrival there the brilliant Larra committed suicide, and at his funeral Zorrilla, unknown and unannounced, read some verses that set the whole town talking of him. His first collections of verse, published in 1837 and 1839, show too much the influence of his favorite authors, the French romanticists; but in the *Cantos det trovador; coteccíón de leyendas y tradiciones* (3 vols., Madrid, 1840–41) his peculiar and original qualities are more plainly to be seen. Here his aspiration to be the Spanish Lamartine, a romantic yet Christian poet, begins clearly to reveal itself. This volume was followed by *Ftores perdidas* (1843); and in 1844 he had completed what is in some ways his best work, the strange religious drama *Don Juan Tenorio*, in two parts, in which this traditional villain is represented as saved at last through the intercession of his own victims. The piece contains obvious reminiscences of *Faust* and is in many ways fantastic; yet it has proved one of the most popular of modern Spanish plays. The poet, deriving little money from the sale of his works in Spain, was encouraged by the wide sale of Parisian editions to think that he could better his fortunes in the French capital. He undertook a long epic poem, *Granada, poema oriental*, two volumes of which appeared in Paris in 1853–54. The work was pecuniarily a failure, and has never been finished. In his discouragement Zorrilla determined now to go to Mexico (1854). He was received with enthusiasm, and, after Maximilian had established himself, the poet was put in charge of the court theater. Obliged to return to Spain in 1866, as he supposed temporarily, he there learned of Maximilian's fall and execution (June 19, 1867). There was nothing to do but work for a scanty livelihood with the pen. Finally, the Government gave him a sinecure literary mission to Italy; and when this also had been for some time withdrawn he was given a pension of 7,500 pesetas (1889) and made chronicler of his native province. Of his later works we may mention *Álbum de un loco* (1867); *Poema religioso* (1869); *Composiciones varias* (1877); *Leyenda del Cid* (1880); *Recuerdos det tiempo viejo* (3 vols., 1880-83); and a volume of lectures delivered at the Ateneo in Madrid, *Lecturas púbticas* (1877). Several of his comedies,

inspired by the great playwrights of the seventeenth century, have had considerable success, notably *El Zapatero y el rey* and *Á buen juez mejor testigo*. In 1889 Zorrilla was crowned poet in the Alhambra at Granada. D. at Madrid, Jan. 22, 1893. A. R. MARSH.

Zos'imus: pope 417–418; first noted for his relations to Pelagianism, his restoration of the African priest Apiarius, and his adjudication on the question of the jurisdiction of Arles over Vienne. In the beginning of his pontificate he was deceived by the orthodox-sounding protestations of Cœlestius and Pelagius, so far as to desire judgment withheld by the African bishops until the personal guilt of the heretics should be proven. He was shortly undeceived as to the heretical notions of both, and condemned them in a letter known as *Epistola Tractaria*. Zosimus never subscribed to any Pelagian propositions, as he was certainly aware of their condemnation by his predecessor, Innocent I. St. Augustine positively says that his intervention was only in the nature of a suspension of judgment, or a *correctionis clementissima suasio, non approbatio exitiosissimæ pravitatis*. See Hergenroether, *Kirchengeschichte*, vol. i., p. 424. JOHN J. KEANE.

Zosimus (in Gr. Ζώσιμος): a Greek historian of the fifth century, of whose personal life nothing is known, but whose work, a history of the Roman empire from Augustus to 410, is still extant, edited in 1837 by Bekker and in 1887 by Mendelssohn. Zosimus was a pagan, and attacks those Roman emperors who were Christians with great acrimony.

Zouaves, zoo-aavz' [= Fr., from *Zouaoua*, name of a Kabyle tribe in Algeria]: According to Ruffino, a body of Zouaves, or Zuaghi, tribesmen distinguished for bravery and skill, was in the service of the Sublime Porte in 1574. Prior to the French occupation of Algeria these Kabyle tribesmen were employed as mercenaries by the Barbary states. The French, after the conquest of Algiers, found themselves with a limited force in the midst of a hostile population, of whose manners and language they were ignorant. Gen. Clausel thereupon (1830) organized two battalions of Zouaves, designed at first to consist of natives only; but subsequently the officers, non-commissioned officers, and some of the privates were selected from French volunteers. The first volunteers of La Charte and some foreigners were also incorporated with them. The foreigners were subsequently organized into a foreign legion, and the Zouaves remaining consisted almost entirely of young Parisians and natives from the vicinity of Algiers. They were at once put into active service, and distinguished themselves by their bravery and dash in all the subsequent battles in Algeria.

Difficulty having been experienced in keeping up the mixed command, the natives were eventually organized into a separate corps known as Turcos, and the Zouaves became entirely or almost entirely French. Their organization was modified and their numbers increased by degrees; and service with them came to be regarded as the best possible school for ambitious officers of the French army. It was eagerly sought by many who subsequently rose to the highest rank and distinction. During the Crimean war the services and successes of the Zouaves were most conspicuous, and many innovations in modern drill tactics may be traced to methods introduced by them. The Zouaves served with distinction in the campaign in Mexico, and participated in the war of 1870–71. Their present organization consists of four regiments, each of four battalions of four companies. There are also in the French army four corresponding regiments of Turcos. In Algeria there are also *cadres* for ten battalions of Zouaves.

The *Pontifical* or *Papal Zouaves* were a body of volunteers, principally from the noble families of France, organized in 1860 by Baron Charette under the direction of Gen. Lamoricière for the defense of the temporal power of the pope. They fought with bravery in several actions, but were unpopular with the Italians, being regarded as foreign intruders. In 1870 they embarked for France, and returning to Tours were under Baron Charette as colonel recruited up to two battalions. Joining the army of Orleans, they fought with distinction at Orleans and Patay. They subsequently assisted the army of Versailles in suppressing the Commune. Their organization was dissolved after the entry of the army of Versailles into Paris.

During the civil war in the U. S. several regiments of Zouaves were organized, who wore uniforms similar to that of the French Zouaves; some of them served with marked distinction. JAMES MERCUR.

Zrinyi, or **Zrini**, zreen'yĕe, Count MIKLÓS: soldier and ruler; b. in 1508 of the illustrious Slovak family of the Counts of Brebir; became banus (governor) of Croatia, Dalmatia, and Slavonia in 1542; distinguished himself in the Austrian army against the Magyars under ZAPOLYA (*q. v.*) and the Turks under Sultan Suleiman II., and defended Croatia with great success for twelve years against the Osmans, whom he defeated at Sziget in 1562. When Suleiman in 1566 attacked Sziget from Belgrad, Zrinyi held the place with unparalleled bravery from Aug. 6 to Sept. 7 against a Turkish force of 65,000 men. Suleiman died on Sept. 4, and the final capture of the ruins cost the Turks 20,000 men. Zrinyi had the powder-magazines fired in the last moment, and thus destroyed the place, the enemy, and himself. His heroic death has been repeatedly dramatized, in the most classical way by Theodor Körner.—Zrinyi's great-grandson of the same name (1616–64), also a warrior, statesman, and banus of Croatia, wrote an epic *Szigeti veszedelem* (Fall of Sziget), in which he celebrated the great deeds of his ancestor in fifteen songs. This is the oldest Hungarian epic, and has recently been edited by K. Abafi, and partly translated by G. Steir. HERMANN SCHOENFELD.

Zschokke, tshŏk'ke, JOHANN HEINRICH DANIEL: author; b. at Magdeburg, Germany, Mar. 22, 1771; was educated in the gymnasium of his native city, but left it in 1788, and accompanied for some time a band of strolling actors as their play-writer. Shortly after, however, he went to the University of Frankfort-on-the-Oder, where he pursued various lines of study—theology, philosophy, history, political economy, and belles-lettres—and began to give lectures in 1792. Meanwhile, his dramatic compositions, *Abällino* (1793), *Julius von Sassen* (1796), etc., attracted considerable attention; but in 1795 he wrote against certain religious edicts of the Prussian Government, and when he in 1796 applied for a professorship, he was rejected. Leaving Prussia immediately, he settled at Reichenau, canton of the Grisons, Switzerland, and took charge of a large educational institution. The institution prospered, and Zschokke was made a Swiss citizen. Soon he also began to take a most active and influential part in the politics of the country, acting, however, as a mediator rather than as a partisan. In 1798 he removed to Aarau, and was made chief of the department of public education, but in 1801, when the central Government in Berne attempted to restore the old federal constitution, he retired from public life and took up his residence at Biberstein. In 1803, however, he was recalled and made a member of the board of forests and mines, and from that time to his death, at Biberstein, June 27, 1848, he continued to hold various positions in the Government of the republic. His celebrity, however, and also his influence, rest chiefly on his literary activity. He edited *Der aufrichtige und wohlerfahrene Schweizerbote* (1804–07), *Miszellen für die neueste Weltkunde* (1807–13), and *Ueberlieferungen zur Geschichte unserer Zeit* (1817–23), which periodicals were much read; and his *Sämmtliche Werke*, relating to history, political economy, fiction, and devotion, comprise 40 vols. His most celebrated work is *Stunden der Andacht* (1806; twice translated into English, the last time in 1862 by Frederica Rowan, under the title *Meditations on Death and Eternity*). Of his historical works the most remarkable are *Geschichte vom Kampfe und Untergange der schweizerischen Berg- und Waldcantone* (1801); *Geschichte des bayerischen Volks und seiner Fürsten* (4 vols., 1813–18); *Des Schweizerlandes Geschichte für das Schweizervolk* (1822; translated into English by F. G. Shaw, New York, 1855). Of his novels (10 vols.) selections have been made and published in English (Philadelphia, 1845; New York, 1848, by Parke Godwin; and London, 1848). His autobiography, *Selbstschau* (1842), has also been translated into English (London, 1847). See the *Lives*, by Emile Zschokke (3d ed. 1876), and by Borrn (1886), and Keller's *Beiträge zur Politischen Thätigkeit H. Zschokkes, 1798–1801* (Aarau, 1887). Revised by JULIUS GOEBEL.

Zubly, JOHN JOACHIM, D. D.: clergyman; b. at St. Gall, Switzerland, Aug. 27, 1725; was ordained in 1744; came soon afterward to America; took charge of the Independent Presbyterian church at Savannah, Ga., 1760; preached in English and German, and occasionally in French; was active among the "Sons of Liberty" and as a member of the first provincial congress of Georgia 1775; was chosen to the Continental Congress the same year; opposed the Declaration of Independence, after which he suddenly went to Georgia, where he took sides with the crown and had to

concealed himself from popular resentment; was in that city during the siege of 1779; was banished from Savannah and went to South Carolina, but returned to his pulpit. D. at Savannah, July 23, 1781. He was a man of learning, and published a number of patriotic discourses.

Zuccaro, dzook'kăă-rō, FEDERIGO: painter; b. at Sant' Angelo in Vado, Urbino, Italy, about 1542; a brother and pupil of Taddeo Zuccaro. He finished painting the frescoes in the Church of the Trinità del Monte in Rome begun by his brother. He was then called to Florence to finish the cupola in Santa Maria del Fiore begun by Vasari. In Rome the dome of the Paolina chapel, begun by Michelangelo, was confided to him, but having avenged himself by a picture of Calumny on some favorites of Pope Gregory XIII., who had insulted him, he had to fly from Rome. He then traveled in Flanders, Holland, and England, after which he went to Venice, where the senate invited him to paint a fresco in the Sala del Gran Consiglio beside those of the greatest masters. He painted in S. Francesco della Vigna in oil on marble a representation of the *Adoration of the Magi*. He was again called to Rome by the pope, who forgave his escapade and wished him to finish the work begun there. Philip II. then invited him to Madrid, where his work was not liked, and what he did was effaced, but he was handsomely compensated. On his return to Rome he was elected president of St. Luke's Academy. He built himself a palace on the Pincio, which he adorned with frescoes. He returned to Spain after this, but with no better success than the first time. Federigo was an architect and sculptor, and also a writer in prose and verse. D. at Ancona in 1609. W. J. STILLMAN.

Zug, Germ. pron. tzooch: the smallest canton of Switzerland, nearly in the center of the republic; area, 92 sq. miles (see map of Switzerland, ref. 4–G). The inhabitants speak the German language and belong to the Roman Catholic Church. The southern part is mountainous; rearing of cattle and dairy-farming are the principal occupations. The northern part, along the Lake of Zug, belongs to the Swiss plain, and is covered with grain-fields, orchards, and vineyards. Some manufactures of paper, silk, and cotton are carried on. Pop. (1900) 25,045. Capital, Zug.

Zuider Zee: another spelling of ZUYDER ZEE (*q. v.*).

Zuinglius: Latin form of ZWINGLI (*q. v.*).

Zulia, thoo'lĕĕ-ăă, formerly *Maracaibo*: the northwesternmost state of Venezuela, surrounding Lake MARACAIBO (*q v.*), and bordering on the Caribbean Sea, Falcon, Lara, Los Andes (or Zamora), and the republic of Colombia. The peninsula of Guajira is now separated as a territory. After being several times united to Falcon, Zulia was separated from it by the constitution of 1893. The western, southern, and eastern frontiers are mountainous, but Lake Maracaibo is bordered by low and often swampy lands; these and the mountain sides are covered in great part with luxuriant forest. Agriculture is almost the only industry, the chief products being coffee, cacao, and sugar. Area, 24,969 sq. miles. Pop. about 100,000. Capital, Maracaibo. H. H. S.

Zu'luland [deriv. of *Zulu*, from Zulu *Ama-zulu*, Zulus, liter., people of heaven, deriv. of *zulu*, sky, heaven]: the country of the Zulus; bordering on the Indian Ocean, and formerly extending from Natal nearly to the Portuguese possessions in Southeast Africa, and inland to the mountain barrier of the South African republic. As a result of the fierce war (1879) between the Zulus and British, and of the territorial ambitions of the Boers, the country has been wrested from native control. Cetewayo was the last king of the independent native dynasty. He was crowned in 1873, and his word was law from the Tugela river to Delegoa Bay. His army of 40,000 men was a standing menace to the neighboring territories. The war of 1879 resulted in his dethronement, and though the British decided to restore him, his power and spirit were broken. He died at Ekowe, Feb. 8, 1884. All that the British have retained, about two-thirds of the country, is a protectorate under the administration of the governor of Natal. A district comprising about a third of the whole territory lying in West Central Zululand was seized (1884) by a party of Boers, who established an independent state; and when Zululand was declared British territory (1887) this section was handed over to the South African Republic. Most of the country is a productive table-land with a climate not injurious to Europeans. Area of British Zululand, 12,500 sq. miles. Pop. (1893) 163,447 natives and 857 whites. C. C. ADAMS.

Zumalacarreguy, thoo-maa-laa-kaar'rā-gee, TOMAS: soldier; b. at Ormaiztegui, province of Guipuzcoa, Spain, Sept. 29, 1789; was a leader of the guerrillas during the Spanish war of independence 1808–14; served under Quesada 1822; was dismissed from the army as a Carlist 1832; on the outbreak of the Carlist insurrection 1833 was appointed by the pretender Don Carlos general-in-chief of his army, and conducted its operations with great skill and daring until he was mortally wounded at the siege of Bilbao, one of the principal cities of Spain, June 15, and died June 25, 1835.

Zumarraga, thoo-maar'raă-gaă, JUAN, de: a Franciscan; first Bishop of Mexico; b. at Durango, in Biscay, 1468. He was long guardian of the convent of Abrojo in Spain, and was named bishop of the new see of Mexico Dec. 12, 1527. Zumarraga has been deservedly praised for his zeal and piety, and under him the missions of Mexico were widely extended with excellent results. Soon after his arrival in Mexico, he instituted a careful search for Aztec manuscripts; these were gathered in great numbers, condemned as heretical books, and publicly burned in the square of the capital. Similar burnings took place in nearly every Mexican city, by the bishop's order; very few of the precious documents escaped destruction, and these were hidden away during centuries. Zumarraga died at Mexico, June 3, 1548, eight days after receiving the bull which raised his see to an archbishopric. H. H. S.

Zumpt, tsoŏmpt, KARL GOTTLOB: classical scholar; b. in Berlin, Germany, Mar. 20, 1792; studied classical languages and literature at Heidelberg and Berlin, and was appointed Professor Extraordinary of Roman Literature at the University of Berlin in 1827, and professor in 1838. D. at Carlsbad, June 25, 1849. He published editions of Curtius, Cicero's *De Officiis*, and (with Spalding) of Quintilian; wrote a Latin grammar (1818), which passed through many editions and was translated into English, but it is now no longer used; published numerous essays relating to classical antiquity, among which are *Annales Veterum Regnorum et Populorum, imprimis Romanorum* (1819; 3d edit. 1862); *Ueber den Stand der Bevölkerung und die Volksvermehrung im Altherthum* (1841); *Ueber die bauliche Einrichtung des römischen Wohnhauses* (1851); and a celebrated treatise, *Ueber den Bestand der philosophischen Schulen in Athen und die Succession der Scholiarchen* (1843). See A. W. Zumpt, *De C. Zumptii vita et studiis narratio*, Berlin, 1851. —His nephew, AUGUST WILHELM ZUMPT, b. at Königsberg, Dec. 4, 1815; studied classical philology at the University of Berlin; was appointed professor at the Friedrich-Wilhelm Gymnasium in Berlin in 1851, and wrote, besides other works, *Ueber die Entstehung und historische Entwickelung des Colonats* (1845); *Commentationes Epigraphicæ ad Antiquitates Romanas pertinentes* (2 vols., 1850–54); *Das Criminalrecht der römischen Republik* (2 vols., 1869). D. in Berlin, Apr. 22, 1877. See Padeletti, *August Wilhelm Zumpt*, Leipzig, 1878. Revised by A. GUDEMAN.

Zungaria: See SUNGARIA.

Zuñian Indians: a family of American Indians, of Western Central New Mexico; first discovered by Fray Marcos de Niza in the year 1539, and named by him the people of Cíbola or Cívola. This is but a corruption of *Shi'wi-na* or *Shi'wo-na*, the Zuñian name for the country they then inhabited. As early as 1583, however, these Indians are referred to by Antonio de Espejo as the people of the "Province of Zuñi, and by the Spaniards called Cibola." This tribal name of Zuñi is said to have been derived from the Keresan Sun'yi-ga or Su'inyi, signifying "people of the long fingernails"—apparently referring to a custom of the native medicine-men.

Tribes and Pueblos.—At the time of the Spanish explorations in the sixteenth century the Zuñian Indians were divided into seven tribal communities, occupying as many distinct pueblos. This latter circumstance gave rise to the rumor of the "Seven Cities of Cibola," and, combined with the pre-eminence of the Zuñis in other ways, made them early the most widely known and respected of all the tribes of the arid region. They were regarded by nearly all tribes, from the north of Arizona and New Mexico to far into Old Mexico, as the leaders in the arts, in government, and especially in magic—as the "Fathers of the Pueblos."

Although greatly reduced in numbers, the Zuñians still maintain this septenary arrangement in their three farming pueblos as well as in the plan of their central or permanent pueblo of Zuñi. For example, the latter, although apparently but a single-terraced mass of piled-up houses, is really

divided into seven distinct portions or blocks by the courts and alleys which either separate or thread its parts. These divisions correspond both in distribution and in the native nomenclature to the original pueblo or town subdivisions of the Zuñians, and each (excepting the seventh or middle division) has its own distinct kiva or estufa of one of the six regions—that is, northern, western, eastern, southern, upper, and lower.

There are three summer, or farming, pueblos—Tâiakwin ("place of planting"), K'ia'pkwainakwin ("place of hot flowing waters"), and Heshotatsi'nakwin (the "builded town of inscriptions"), so named from the petrographs on the older walls of the houses.

In Tâiakwin, or the pueblo of Las Nutrias (until within very recent times), the clans pertaining to the north and west had their quarters together. In Ojo Caliente those pertaining to the south and east were harbored; while in He-sho-ta tsi-na (at Ojo de los Pescados) those pertaining to the upper and lower regions were placed. Finally, the chief house-priests, although represented by subordinates at these outlying places, were supposed not to leave the main pueblo, even during summer; and during the colder season all the people returned from the farming towns and gathered about them there.

Habitat.—The original seven towns of the Zuñis—the "Seven Cities of Cibola"—and the more or less cultivated lands surrounding them occupied the whole Zuñi valley (3 to 10 miles in width), from the eastern boundary of Arizona to the Cañon Gateway of Zuñi, nearly 30 miles E. N. E. from this line.

This and the confluent valley of Ojos Calientes had been the abode of the Zuñis for nearly four centuries at the time of the discovery and conquest. Probably not more than a century previously to the latter events (in 1539–40) the now ruined towns farther E.—to beyond Ojo Pescado in the Upper Zuñi valley, and in tributary cañedas to the S.—had been occupied by the so-called Corn-tribes, or A'tâ-akwe, division of the Zuñis; but at the time of the journey of the pioneer missionary, Fray Juan de Padilla, with Hernando de Alvarado, of Coronado's conquering army in 1540, these towns were already deserted and in ruins.

General Characteristics.—Two physical types of men and women occur side by side in the present tribe, notwitstanding generations of intermarriage. One of these may be regarded as the more distinctly Zuñian, since it is unrepresented among other tribes of Pueblo Indians save through Zuñian derivation, as in Laguna and Jemez. The other so closely resembles the Keresan type that it seems due to the absorption of Indians of the latter stock into the supposititious original Shiwian or strictly Zuñian family. Belonging to the distinctively Shiwian type are the majority of "summer clans" of the Zuñis—in the main one of which, the Macaw, the principal priestly offices (the masterships of the houses or regional kivas, as they are called), are hereditary. Although the men of this type do not often exceed 5 feet in height, the women generally seem like young girls beside them, except for their greater breadth of shoulder and general rotundity. All have very clear-cut features, with noses straight or more or less aquiline and thin; nares moderately broad, but not fleshy; lips thin, but curved, drooping at the corners; eyes straight, chins prominent, and cheek-bones very pronounced; foreheads sloping, but broad and capacious, and ears of medium size or large. Their heads are as often long as brachycephalic. This is the more remarkable since the prevailing cranial form of the Pueblo Indian is short, and since even the long-headed class have in common with most Indians the flattened occiput resulting from the cradle-board of infancy. The hair of both sexes is abundant, long, fine, and often wavy. The men of this Shiwian or pure Zuñian type are more lithe and straighter limbed than those of the general Pueblo type, and their hands and feet are larger. They are also slightly lighter colored, but ruddier, and the women of the same type are both taller and much fairer than those of the Pueblo variety. Although this latter variety is quite distinctly Keresan, there is a greater prevalence of oblique eyes, giving them a mongoloid look, and they are not quite so dark as the Keresan women, whom they so much resemble. One in every 200 of the population is a typical albinoid, the skin being very fair, eyes blue or pinkish gray, and hair flaxen, golden, or light brown. And again, so-called hermaphrodites—monstrous, overdeveloped women (not counting men who are ceremonially relegated to their rank)—bear about a similar proportion to the population.

The Zuñis are intellectual and grave, yet deliberately, almost unemotionally, witty. They are intensely mythic-minded, and hence poetic and religious to an extreme degree. They are peace-loving and unusually self-restrained, and in disposition are perhaps the politest of North American aborigines, being exceedingly, because religiously, ceremonious even in ordinary intercourse. While unaggressive in both policy and tendency, yet they are intensely courageous and determined when defending their rights, which they guard with a jealousy more fanatical than patriotic.

Until the introduction of articles of civilization a few years ago the dress of the Zuñi consisted more purely of the primitive native fabrics and fashions of garment than that of any other Pueblo Indians excepting the Oraibe. The men wore the typical Pueblo pantalettes and plain, fairly close-fitting shirts, open at the armpit, all of cotton, either native or bought of the whites, as were their red or black silk or bandana head-sashes.

History.—Tradition seems to testify, and archæologic studies confirm the evidence, that the Zuñians in far-off times occupied the region of the Rio Colorado, and that at an even more remote period they had descended to this great valley from the northwest and west.

The ancestors of the present Zuñians gradually penetrated the valley of the Rio Zuñi, a division of them wandering away as far as the prehistoric Tañoan territory, to return after a long time, differentiated from their people to an extent even still slightly perceptible, and imbued with customs so distinct that they were for a long time held off from the central body, which meanwhile settled mainly in the Zuñi valley. Here they built and occupied the Tâiakwin or Las Nutrias towns to the N. and E. of Zuñi. Tâiakwin itself they seem never to have permanently abandoned, and it is still held by their principal descendants as a farming village.

Another division of the tribe (the so-called Corn-grain people, partly derived from the southern branch, from the upper Colorado Chiquito) built the long series of beautiful stone ruins beginning in Eastern Arizona, extending through valleys S. of Zuñi in New Mexico, and reaching as far E. as the double pueblo on Inscription rock or El Morro, including also the circular ruins at and above and below Los Ojos Pescados. The traces of their stone-paved reservoirs, their land-tilling and irrigation operations, and the superior character of their works of art, quite justifies their name as the People of Corn or People of Great Harvests. For a long time they dwelt amicably apart from their central Zuñi brethren, joining them at last in a war waged upon a series of Keresan tribes in Ma-k'y'a-ta, or Ma'k'yanawan. This latter pueblo group was the "Province of Marata" of Marcos de Niza and the Zuñi name of the American valley and Salt Lake region. At the time of Niza's visit this war was still a fresh incident, and had resulted in the subjugation of the Salinas, Keres, their absorption into the Corn and Zuñi tribes, and the gathering into one set of towns—the "Seven Cities" of all the tribes. Probably these events, which are historic as well as traditional, will account for the presence of a Keresan type of people among the Zuñis to-day.

In the spring of 1539 Estevan, the Negro companion of Fray Marcos de Niza, first discovered K'ia'kime, the most easterly of the seven cities, at the base of Tâaiyalane or Thunder Mountain. The inhabitants of this town killed him, and the monk who followed fled for his life, but gained from neighboring Indians, and has left us, the first and most accurate account of the Zuñis ever until lately written. In the following year Coronado followed with his army and subdued the people of Ha'wiknh, the greater number of whom, with many of the neighboring villagers, fled to the top of their common Gibraltar, Tâaiyalane, but soon after submitted. Between 1542 and 1580 Kwakina, the westernmost of the seven towns, was abandoned. Between 1598 and 1680 Hampassawan and K'ia'nawe were also practically deserted in consequence of pressure from the predatory Apache and Navajo, and in 1672 Hawikuh was permanently abandoned for the same cause.

Meanwhile the Franciscans had established missions at five, if not six, of the towns, but the isolated Zuñis were restive under this religious pressure, and in 1630 killed their friars, Francisco Letrado and Martin de Avide, and fled again to their citadel on Thunder Mountain. At the outbreak of the great Pueblo rebellion of 1680–92 they were living in the three towns of Ha'lona, Ma'tsaki, and Ki'akime, but with that uprising they again sought their mountain

refuge, and rebuilt there their sixfold citadel, adding a seventh group of buildings for the fugitive Keresans from Acoma. Here they continued to dwell until after the peace of de Vargas, when they descended and again occupied the three last-mentioned towns.

In 1704 the Zuñis of the central town killed three Spanish soldiers, and retreated for the third time to their rock of refuge, after descending from which they do not seem to have permanently occupied any save Ha'lona, the midmost of their towns—the site of the present Zuñi. Nevertheless, to escape espionage and to practice in the old divisional way their religious ceremonies, they built in the high mesas N. of Zuñi yet seven other towns called the "Peach" or "So'noli" villages (the peach having been introduced from Sonora in the beginning of the century), maintaining the planting and care of their orchards of this fruit as their excuse for dwelling as much as possible apart from the Spaniards at their central abode.

The Zuñis joined in the war with Mexico, and later under Gen. Kearny and his successors in that against the Navajos, but after this they continued to tend their sheep and cattle and till their corn-fields and irrigated patches of wheat at their three summer pueblos, indifferent toward the outside world, as had for centuries been their wont.

Population.—At the time of the Pueblo conquest by Coronado in 1540, the seven tribes of Zuñi or Cibola numbered about 4,000. Benavides in 1630 gave the population at 10,000 souls, this, of course, being a gross exaggeration. According to Vetancurt the tribe numbered 2,500 at the time of the Pueblo revolt of 1680, and judging from a partial count of the houses in the ruins of the pueblos occupied at that date, the estimate is doubtlessly approximately correct. In the eighteenth century the Zuñis had been reduced to about 2,000, while in 1890 they numbered 1,613. They are not rapidly decreasing.

AUTHORITIES.—See Bandelier, in *Reports*, *Bulletins*, and *Papers* of the Archæological Institute of America, 1881–92, and works cited therein; also his *Discovery of New Mexico by Fray Marcos of Nizza* in *Magazine of Western History* (Cleveland, O., Sept., 1886); and *An Outline of the Documentary History of the Zuñi Tribe* (in *Jour. Am. Eth. and Arch.*, iii., Boston, 1892); Ten Kate, *Somatological Observations* (in *ibid.*); Hubert H. Bancroft, *History of Arizona and New Mexico* (San Francisco, 1889; Mindeleff, *Architecture of Cibola and Tusayan* (in Eighth Annual Report of the Bureau of Ethnology, 1886–87); Stevenson, *Religious Life of the Zuñi Child* (in Fifth Annual Report of the Bureau of Ethnology, 1883–84); Fewkes, *A few Summer Ceremonials at Zuñi Pueblo* (in *Jour. Am. Eth. and Arch.*, i., Boston, 1891); Gilman, *Zuñi Melodies* (in *ibid.*); Cushing, *Adventures in Zuñi* (in *Century Magazine*, Dec., 1882; Feb. and Apr., 1883); *ibid.*, *Zuñi Fetiches* (in Second Annual Report of the Bureau of Ethnology, 1880–81); *ibid.*, *Pueblo Pottery*, etc. (in Fourth Annual Report of the Bureau of Ethnology, 1882–83); *Manual Concepts* (in *Am. Anthropologist*). See INDIANS OF NORTH AMERICA and PUEBLO INDIANS. FRANK HAMILTON CUSHING.

Zuñiga: See ERCILLA Y ZUÑIGA.

Zuñi Mountains: a range of New Mexico; between the 35th and 36th parallels of N. lat.; intersected by the 108th meridian W. from Greenwich. Fort Wingate is at its northwestern end, and old Fort Wingate at its southeastern. Its length from N. W. to S. E. is 45 miles; its breadth is 20 miles. It rises 3,000 feet above the surrounding country, which has a general altitude of 6,500 feet; broadly arched at top, and is clothed with timber. The proportions and scenery of the range are not imposing, and it is overtopped by the neighboring volcanic peak of Mt. Taylor, but it is of great interest to the student of "mountain-building," on account of its simplicity of structure and its isolation. All about it the rocks lie in level strata; at its base they are bent upward, and they arch over its top in simple curves. At the southeast end erosion has removed the crest of the arch and exposed the crystalline rocks which underlie the stratified, but at the N. the continuity of the lower strata is unbroken, and they can be traced from side to side. The range is monographed by C. E. Dutton in the Sixth Annual Report of the United States Geological Survey. G. K. G.

Zunz, tsŏonts, LEOPOLD: b. at Detmold, principality of Lippe, Germany, of Jewish parentage, Aug. 10, 1794; studied philology at Berlin; was preacher at the synagogue of Berlin 1820–22; editor of the *Spenersche Zeitung* 1824–32; preacher at the synagogue of Prague 1835–39; director of the normal seminary at Berlin 1839–50; became in 1845 member of the board of commissioners for the educational interests of the Jews in Prussia. His first work, *Etwas über die rabbinische Litteratur* (Berlin, 1818), attracted much attention; also his principal work, *Die gottesdienstlichen Vorträge der Juden* (1832); and several others of his writings, *Die Namen der Juden historisch entwickelt* (1836; 2d ed. by N. Brüli, 1892); *Die synagogale Poesie des Mittelalters* (2 parts, 1855–59; supplement, *Literaturgeschichte der synagogalen Poesie*, 1865–67), etc. A collected edition of his works was commenced in 1875, but never got beyond the first volume. D. in Berlin, Mar. 17, 1886.

Revised by S. M. JACKSON.

Zurbaran, thoor-baä-raan', FRANCISCO: painter; b. at Fuente de Cantos, in Estremadura, Spain, Nov. 7, 1598. He studied with Juan de Roelas at Seville when quite young, painting directly from nature, a habit that procured for him the appellation of the Spanish Caravaggio. At the age of twenty-one Zurbaran had already a great reputation and innumerable orders in Seville, where he lived and worked almost all his life. The great altarpiece in the chapel of St. Peter of the Cathedral of Seville is his first important work, completed in 1625. Soon after this he produced his picture for the College of St. Tomas, now in the museum of Seville, representing the Eternal Father above colossal figures of St. Thomas Aquinas and the four Fathers of the Church, with the Emperor Charles V. with his nobles kneeling in rapt devotion on one side, and on the other the archbishop with his Dominicans; also, the series representing incidents in the life of St. Peter Nolasco were produced in 1629. These are now to be seen partly in Seville Cathedral, partly in the museum of the Prado of Madrid, and some in the Academy of St. Fernando. The subjects from the life of St. Bonaventura for the church of that name are dispersed also, two being in the Louvre, one in the Gallery of Dresden, and another in Berlin. The king, Philip IV., had him come to Madrid to decorate his palace of Buenretiro with the *Labors of Hercules*. Zurbaran had the title of Painter of the King as early as 1633, as the signature on some of his pictures shows; but in 1650, through the intervention of his friend Velázquez, he removed to the capital, where he painted in his Majesty's service till he died in 1662. His work is to be seen in the museums of St. Petersburg, Pesth, Munich, Paris, and London, and in many private collections. W. J. S.

Zurich, zoo'rik (Germ. *Zürich*, tsü'rich): canton of Northeastern Switzerland, bordering on the Rhine and on Lake Zurich; area, 666 sq. miles. The inhabitants speak German and are Protestants. It consists of three elevated valleys, and contains excellent pastures. The soil is not very fertile. Grain and wine are produced, though dairy-farming and manufacturing are the principal occupations. Pop. (1900) 430,135. Capital, Zurich.

Zurich: capital of the canton of Zurich, Switzerland; 43 miles N. W. of Glarus; on the Limmat where it issues from the Lake of Zurich (see map of Switzerland, ref. 2–G). It is well and substantially built, though somewhat old-fashioned in its appearance. It has a university, a public library with more than 100,000 volumes, a botanical garden, several museums of natural history, and a federal polytechnic school to which pupils from all Europe gather. Its manufactures comprise silk, cotton, leather, ribbons, lace, etc., and are extensive. Pop. (1888) 28,225; with the suburbs (1893) 103,271; (1900) 150,239.

Zurich, Lake of: lake of Switzerland; 23 miles long and 2½ miles broad; bounded by the cantons of Zurich, Schwytz, and St. Gall, and celebrated for the picturesque beauty of its scenery.

Zurita, thoo-ree'-taa, GERONIMO: historian; b. at Saragossa, Spain, Dec. 4, 1512; son of the favorite physician of Ferdinand the Catholic; educated at Alcalá; became a magistrate and a member of the supreme council of Castile 1543; was employed in diplomatic service in Germany 1543–49; became chronicler of Aragon 1549; traveled through Spain, Sicily, and Italy in search of historical data, and was afterward private secretary to the king. D. in 1580. Author of *Anales de la Corona de Aragón* (6 vol., 1562–79).

Zut'phen: town; province of Gelderland, Netherlands; on the Yssel; 18 miles N. N. E. of Arnhem by rail (see map of Holland and Belgium, ref. 6–H). It is beautifully situated and well built, though an old city; its walls have

been transformed into promenades. It has tanneries, soap-works, oil and paper mills, spinning and weaving factories, carpet manufactories, and a large trade in wood, bark, and grain. Pop. (1890) 17,044.

Zuyder Zee, zī'der-zee' [= Dutch, liter., South Sea]: a gulf of the North Sea, 80 miles long and 40 miles in greatest breadth. Several islands lie across its mouth, and the principal communication with the North Sea is between the Helder and the island of Texel. It receives the waters of the Yssel and of the Amstel, both delta-branches of the Rhine; at the entrance of the latter the city of Amsterdam is situated. In prehistoric times the Zuyder Zee was larger than at present, but in the eighth century considerable portions of it were dry and under cultivation. The great storm

of 860, followed by those of 1134 and 1164, caused it to be again inundated. It is quite shallow, and the difficulty of navigating the southern part caused the construction of the North Sea Canal and of the Holland Canal as approaches to Amsterdam. The portion shown shaded in the map has only an average depth of 10 feet. The project of draining this area of 487,500 acres has long been discussed, and in 1870 plans and estimates were prepared. A dike was proposed through the sea from Enkhuizen to the river Yssel, a distance of 28 miles. Along the southern edge of this dike a drainage reservoir was to be provided from which the water was to be lifted by steam-pumps. Canals for navigation and drainage were to be built through the reclaimed area, which was to be divided into drainage basins, or polders, along whose dikes railways were to be constructed. The work was estimated to cost about $50,000,000, exclusive of interest, and to require from twelve to sixteen years for its completion. The doubt whether the cost of the work would be repaid by the proceeds of the sale of the reclaimed lands has been, however, so great that this drainage plan has not been undertaken. MANSFIELD MERRIMAN.

Zvor'nik (*Isvornik*): fortified town; district of Tuzla, Bosnia; on the left bank of the Drina, an affluent of the Save (see map of Austria-Hungary, ref. 9–H). It is defended by a citadel, is the seat of a bishopric, and has considerable trade in wood and timber. There are lead mines in the vicinity. Opposite, on the right bank of the Drina, lies *Mali-Zvornik* (Little Zvornik), claimed by Servia according to the treaty of Berlin, July 13, 1878, which established the Drina as the frontier between Austrian Bosnia and Servia. Pop. 3,030. H. S.

Zweibrücken, tsvī-brük'en (French, *Deux-Ponts*): a town of the Bavarian Palatinate; 50 miles W. of Spires (see map of German Empire, ref. 6–C). It is finely situated at the confluence of the Schwarzbach with the Hornbach; is well built, and consists of the old town, the new town, and a new suburb. Its manufactures comprise velvet, silk-plush, cotton, leather, tobacco, and oil. The town is very old, and owes its name to the two wooden bridges across the Schwarzbach. Pop. (1890) 11,204. H. S.

Zwickau, tsvik'ow: capital of the circle of its own name in the kingdom of Saxony; on the left bank of the Mulde, at the base of the Erzgebirge, central station of the Saxon state railways; situated in a beautiful valley (see map of German Empire, ref. 5–F). Among its six churches is St. Mary's, built (1453–1536) in Gothic style, with a tower 314 feet high and the largest bell in Saxony (115 cwt.). The gymnasium has a library of 20,000 volumes and many invaluable MSS. of the Reformation period; there is also a mining-school. The town has machine-shops, iron-foundries, and manufactures of chemicals, woolen goods, paper, oil, flour, porcelain and glass, etc. It lies in the center of a rich coal district, and in its vicinity are about 200 furnaces for the burning of coke. The production of coal amounts to about 2,500,000 tons annually, valued at 17,100,000 marks, and employs about 10,000 laborers. Zwickau is of Slavonic origin and is mentioned as early as 1030; it played a great *rôle* during the Reformation, the Thomas Münzer (Anabaptist) movement originating there. The circle (*Kreishauptmannschaft*) of Zwickau forms the southwestern portion of the kingdom, and is the richest and most industrial district in Saxony. Its population (1895) is 1,389,672; that of the city 50,391. HERMANN SCHOENFELD.

Zwingli, Germ. pron. tsving'lĕĕ, ULRICH or HULDEREICH: Reformer and patriot; b. in a lowly shepherd's cot at Wildhaus, Toggenburg (canton of St. Gall, Switzerland), of honorable and pious parents, Jan. 1, 1484 (seven weeks after Luther), studied at Wesen, Vienna, 1499–1501, and Basel 1502–06; was carried away with the enthusiasm for classical learning, and got an insight into the corruptions of the Church; was ordained priest by the Bishop of Constance, and elected pastor of Glarus 1506. He studied the Greek New Testament very carefully, and copied it with his own hand; preached against the mercenary service of his countrymen; in 1516 accepted a call to St. Mary's at Einsiedeln, and began to attack superstitious practices, but with the consent of his superiors; he even received for a while, as one of the most popular preachers, a pension from the papal nuncio in Switzerland which aided him in his studies and secured his political influence. In Dec., 1518, he was called to the cathedral at Zurich, where he labored till his death. He preached "Christ from the fountains" and "inserted the pure Christ into the hearts"; broke loose gradually from Romanism; introduced the Reformation in Zurich 1524, after some public disputations with the champions of the old system; led the Reform movement in the other German cantons of Switzerland; attended the conference at Berne 1528, which resulted in the abolition of the mass. He was invited to a personal conference with Luther and Melanchthon at Marburg Sept. 1529, to adjust the only serious doctrinal difference between them on the Eucharistic Presence. He counseled energetic measures for the promotion of the Reform in his native land, but was defeated by the policy of hesitation which prevailed in Berne. He also entered into bold political combinations with Philip of Hesse for the triumph of the Protestant cause in Germany, and addressed the Emperor of Germany and the King of France with a confession of his faith. But he was cut down in the midst of his career. At the outbreak of the war between the Roman Catholic and Protestant cantons he accompanied the Zurich regiment as chaplain, according to Swiss custom, and was pierced by a lance in the disastrous battle at Kappel, Oct. 11, 1531, while stooping to comfort a dying soldier. His last audible words were, "What of that? They can indeed kill the body, but they can not kill the soul." His remains were burned, and the ashes scattered to the four winds. A plain monument in granite, erected in 1838, marks the spot where he died.

Zwingli was a bold Reformer, an able scholar, an eloquent preacher, a patriotic republican, and far-sighted statesman. He lacked the genius and depth of Luther and Calvin, the learning of Melanchthon and Œcolampadius, but he was their equal in honesty of purpose, integrity of character, heroic courage, and devotion to the cause of Reformation, and surpassed them in liberality. His prominent intellectual trait was clear, strong common sense. He loved music and poetry, but in public worship he favored puritanic simplicity, and removed all pictures from the churches to prevent the temptation to idolatry. In his theological views he was more radical than Luther, and departed further from the mediæval traditions. He differed chiefly from Luther's view of the real presence of Christ's body and blood in the sacrament, and held this ordinance to be merely a commemora-

tion of the atoning death of Christ; but notwithstanding this difference he offered Luther with tears the hand of brotherhood at Marburg, which was refused. In some points he was ahead of his age, and held opinions which were then deemed dangerous and heretical. He had a milder view on original sin and guilt than the other Reformers, and believed that all infants dying before the age of responsibility, whether baptized or not, and all the nobler heathen who lived up to their standard of virtue and longed after the true religion, are saved by the grace of Christ, which may operate upon the heart without the ordinary means and visible signs. His principal works are a *Commentary on the True and False Religion* (1525); a sermon *On Providence* (preached at Marburg, 1529); his *Confession of Faith*, addressed to Charles V. at the Diet of Augsburg (1530); a similar *Exposition of Faith*, addressed to Francis I. of France (July, 1531, three months before his death). This last document is clear, bold, spirited, and full of hope for the triumph of the truth, warns the king against the slanderous misrepresentations of Protestant doctrines, and entreats him to give free course to the Gospel, and to forgive the boldness with which he dared to approach his Majesty. It is questionable whether he ever read the document. Zwingli represents only the first stage in the history of the Reformed Church. His work was completed after his death by his successor, Bullinger, at Zurich, and still more by Calvin at Geneva. The fourth centennial of his birth was extensively celebrated Jan. 1, 1884, in Reformed churches in Switzerland, Holland, and the U. S. In 1885 a life-size statue of Zwingli in bronze was erected with great popular enthusiasm before the Wasserkirche in Zurich. It represents him with uplifted face, with the sword in one hand and the Bible in the other.

LITERATURE.—*H. Zwinglii Opera*, ed. Schuler and Schulthess (Zurich, 1828–42, 8 vols.); a popular edition of his works translated into literary German by Christoffel (Zurich, 1843, *seq.*, 15 parts); *Biographies* of Zwingli by Myconius (1536; reprinted by Neander, *Vitæ quatuor Reformatorum*, Berlin, 1841); Hess (1811; trans. by Aiken, London, 1812); Hottinger (1843; trans. by Th. C. Porter, Harrisburg, 1856); Christoffel (Elberfeld, 1857; trans. by John Cochran, Edinburgh, 1858); and especially Mörikofer (*Ulrich Zwingli nach den Quellen*, Leipzig, 1867–69, 2 vols.); and R. Stähelin, *Huldreich Zwingli* (Basel, 1895–96, 2 vols.). On the theological system of Zwingli, see Zeller, *Das theolog. System Zwinglis* (1853); Siegwart, *Ulrich Zwingli; der Charakter seiner Theologie* (1855); Spörri, *Zwingli-Studien* (1866); and especially A. Baur, *Zwinglis Theologie* (Halle, 1885–89, 2 vols.). Compare the seventh vol. of Schaff's *Church History*, which is devoted to the Swiss Reformation (New York, 1892). A large number of pamphlets and articles were called forth by the fourth centennial celebration, in 1884.

PHILIP SCHAFF.
Revised by S. M. JACKSON.

Zwol'le: capital of the province of Overyssel, Netherlands; on the Zwarte-Water; 50 miles E. by N. of Amsterdam (see map of Holland and Belgium, ref. 4–H). It is one of the handsomest cities of the kingdom, with broad and straight streets and many public squares. It is the seat of many educational and benevolent institutions, and has manufactures of oil, beer, spirits, linens, and iron goods. By canals it communicates with the Yssel and Vechte, and has a trade in grain, butter, cheese, cattle, fish, and oysters. Pop. (1899) 30,846. Revised by M. W. HARRINGTON.

Zygade'nus, or, less correctly, **Zygabenus**, EUTHYMIUS: a Byzantine theologian, "the last of the Greek commentators." He was monk of a convent dedicated to the Virgin Mary near Constantinople, and flourished under Alexius Comnenus (1081–1118 A. D.), at whose request he wrote his *Panoply against all Heresies*. His commentaries on the Psalms and Gospels are still referred to by scholars. (See his works in Migne's *Pat. Græca*, cxxxviii.–cxxxi.) Other commentaries (on the Pauline and Catholic Epistles) and other works (including letters) are in manuscript in the Vatican. Revised by S. M. JACKSON.

Zygæ'nidæ [Mod. Lat., named from *Zygæ'na*, the typical genus, from Gr. ζύγαινα, probably the hammer-headed shark]: a family of selachians of the order *Squali*, and containing the hammer-headed sharks. The body is moderately elongated and like that of the typical sharks; the head is depressed, transverse, and extended outward or sidewise to a greater or less extent; the mouth is inferior and convex forward; the teeth are moderate and in several rows (in all the known species nearly alike in both jaws, oblique and with a notch); the branchial apertures are five, of moderate size, and the last are above the pectoral fins; the spiracles are nullified in the adult; the dorsal fins are two, the first between the pectorals and ventrals, the second above the anal; the anal is normally developed; the caudal elongated, and with a well-developed lower lobe; the pectoral fins are moderate; the ventrals small. The family is anomalous by reason of the peculiar extension of the sides of the head. This extension is carried to its maximum in the *Eusphyra blochii* (*Zygæna laticeps* of some authors), and is least developed in the *Reniceps tiburo*; in the former it is T-shaped and in the latter kidney-shaped. The common hammer-headed shark (*Sphyrna zygæna* = *Zygæna malleus*) exhibits an intermediate condition. At least five species are known, which by some are differentiated into three genera—*Eusphyra*, *Sphyrna*, and *Reniceps*. The *Sphyrna zygæna* is not uncommon on the U. S. coasts, and the *Reniceps tiburo* is an occasional visitor. See also HAMMERHEAD.

Revised by F. A. LUCAS.

Zygobran'chia [Gr. ζυγόν, yoke + βράγχια, gills]: a group of simple gasteropod molluscs characterized by the possession of gills on either side. It includes the abalones, the keyhole limpets, etc. See GASTEROPODA.

Zygoneu'ra [Gr. ζυγόν, yoke + νεῦρον, nerve]: a term employed by some zoölogists for a group including the pulmonate and opisthobranch molluscs in allusion to the fact that their nerves are not twisted, but have rather the appearance of a yoke. See GASTEROPODA.

Zyg'ophytes (*Zygophyta*): lower plants characterized by the fact that two equal cells unite to form a resting spore (*zygospore*). The Pond Scums (*Zygnemaceæ*) and Black Moulds (*Mucoraceæ*) are common examples of Zygophytes. In the treatment of the lower plants in this cyclopædia the Zygophytes are not regarded as constituting a distinct group. Zygophytic reproduction occurs in the lower families of each order of the *Phycophyta*. See VEGETABLE KINGDOM.

CHARLES E. BESSEY.

Zygospore: See DIATOMS.

Zy'lonite: a plastic material made by treating cellulose with nitric and sulphuric acids and mixing the resulting pulp with camphor, yielding a product similar to celluloid. It is also called xylonite and parkesine. Zylonite in its liquid state, collodion, was first used in surgery by Dr. J. Parker Maynard, of Boston, in 1848, and has since been employed as a dressing in cases where an air-tight covering for light wounds is required. In 1855 Alexander Parkes, of Birmingham, England, obtained a patent for a compound which he called parkesine—solidified or hardened collodion. This material was produced by using vegetable naphtha, alcohol, methyl, and other ethers as solvents for guncotton. Factories for the manufacture of zylonite were established in Great Britain, France, Germany, and in the U. S., but it has been superseded by CELLULOID (*q. v.*).

Zymotic Diseases: See INFECTIOUS DISEASES.

Zytomierz': a town of Russia. See JITOMIR.

UNITED STATES POSSESSIONS
(RED)
ARCTIC OCEAN
ARCTIC CIRCLE
Point Barrow
C. Lisburne
East Cape
C. Pr. of Wales
Bering Str.
Kotzebue Sd.
Anadir R.
Gulf of Anadir
ST. LAWRENCE I.
Norton Sd.
St. Michael
Yukon R.
Coast Inlet
For Yukon
Dawson
Fort Selkirk
Mt. St. Elias
Mackenzie R.
Great Bear L.
Great Slave L.
Fort Smith
Rocky Mts.
Boothia G.
Baffin Bay
Chesterfield Inlet
SOUTHAMPTON I.
Hudson's Str.
HUDSON'S BAY
Fort Churchill
Athabasca L.
Reindeer L.
Port Nelson
York Factory
Nelson R.
James Bay
Fort Albany
Lake Winnipeg
Saskatchewan R.
Winnipeg
Regina
Calgary
Port Arthur
Quebec
Montreal
OTTAWA R.
Portland
Boston
New York
Philadelphia
Baltimore
WASHINGTON
Norfolk
Wilmington
Richmond
Cincinnati
Chicago
Milwaukee
Toronto
Minneapolis
St. Paul
Cheyenne
Great Salt L.
Denver
Omaha
Salt Lake City
Helena
Spokane
Tacoma
Seattle
Victoria
Vancouver
Olympia
Astoria
Portland
Eureka
C. Mendocino
San Francisco
Monterey
Pt. Concepcion
San Diego
Los Angeles
Santa Fe
Memphis
St. Louis
Columbia
Charleston
Mobile
Savannah
Jacksonville
El Paso
Austin
New Orleans
Galveston
Corpus Christi
Brownsville
R. Grande
Matamoras
GULF OF MEXICO
Havana
CUBA
Campeche
Tampico
Belize
CENTRAL AMERICA
CARIBBEAN SEA
PUERTO RICO
Maracaibo
Caracas
Puerto Cabello
Cartagena
Aspinwall
Panama
Bogota
SOUTH AMERICA
Quito
Guayaquil
Paita
LOBOS IS.
Salaverry
Trujillo or Truxillo
Havana
Mazatlan
Manzanillo
Acapulco
G. of Tehuantepec
San Salvador
REVILLAGIGEDO IS.
CLIPPERTON I.
DUNCAN I.
GALLEGO I.
GALAPAGOS IS.
Cable
American
proposed
Line
of
HAWAIIAN OR SANDWICH IS.
Honolulu
OAHU I.
HILO
HAWAII I.
COOPER I.
COPPER I.
GUADALUPE I.
PHILADELPHIA I.
LASKER I.
WAKE I.
CORNWALLIS I.
WALKER IS.
AMERICA IS.
FALMYRA
GREEN I.
MALDEN I.
STARBUCK
PHŒNIX IS.
MARQUESAS IS.
ELLICE IS.
GILBERT IS.
OCEAN I.
MARSHALL ARCHIPELAGO
CAROLINE IS.
PELEW IS.
GUAM I.
LADRONES OR MARIANNE IS.
LUZON I.
Manila
PHILIPPINE IS.
PALAWAN I.
MINDANAO I.
Celebes Sea
BORNEO
EQUATOR
GILOLO I.
CELEBES I.
MOLUCCAS OR SPICE IS.
Banda Sea
TIMOR I.
NEW GUINEA
BISMARCK ARCHIPELAGO
SOLOMON IS.
RICA DE PLATA
PACIFIC OCEAN
TROPIC OF CANCER
FORMOSA
LOO CHOO IS.
BONIN IS.
Hong Kong
Shanghai
Nagasaki
Kicto
Osaka
TOKIO
Yokohama
JAPAN
SEA OF JAPAN
Yellow Sea
Seoul
KOREA
Vladivostok
Hakodate
YEZO I.
PEKING
CHINA
MANCHURIA
Amur R.
SEA OF OKHOTSK
Okhotsk
Lena R.
Yakutsk
SIBERIA
KAMCHATKA
KURILES
Petropaulovsk
SAGHALIN I.
BERING SEA
Bristol B.
PRIBILOF IS.
NUNIVAK I.
ST. MATTHEW I.
ALEUTIAN IS.
UNALASKA
(CATHARINE ARCHIPELAGO)
KODIAK I.
St. Paul Har.
ITKA
Ft. Wrangel
Dixon Entrance
QUEEN CHARLOTTE'S IS.
Port Simpson
Juneau
Fort Simpson
Mts.
Great Slave L.
Fort Smith
Fort Churchill
Athabasca L.
Reindeer L.
Port Nelson
York Factory
Nelson R.
James Bay
Fort Albany
Lake Winnipeg
Saskatchewan R.
Winnipeg
Regina
Calgary
Port Arthur
Quebec
Montreal
OTTAWA R.
Portland
Boston
New York
Philadelphia
Baltimore
WASHINGTON
Norfolk
Wilmington
Richmond
Cincinnati
Chicago
Milwaukee
Toronto
Minneapolis
St. Paul
Cheyenne
Great Salt L.
Denver
Omaha
Salt Lake City
Helena
Spokane
Tacoma
Seattle
Victoria
Vancouver
Olympia
Astoria
Portland
Eureka
C. Mendocino
San Francisco
Monterey
Pt. Concepcion
San Diego
Los Angeles
Santa Fe
Memphis
St. Louis
Columbia
Charleston
Mobile
Savannah
Jacksonville
El Paso
Austin
New Orleans
Galveston
Corpus Christi
Brownsville
R. Grande
Matamoras
GULF OF MEXICO
Havana
CUBA
Campeche
Tampico
Belize
CENTRAL AMERICA
CARIBBEAN SEA
PUERTO RICO
Maracaibo
Caracas
Puerto Cabello
Cartagena
Aspinwall
Panama
Bogota
SOUTH AMERICA
Quito
Guayaquil
Paita
LOBOS IS.
Salaverry
Trujillo or Truxillo
Mazatlan
Manzanillo
Acapulco
G. of Tehuantepec
San Salvador
REVILLAGIGEDO IS.
CLIPPERTON I.
DUNCAN I.
GALLEGO I.
GALAPAGOS IS.
ATLANTIC OCEAN
Long. East
Long. West
from Greenw.
from Wash.
120 130 140 150 160 170 180 170 160 150 140 130 120 110 100 90 80 70
163 153 143 133 123 113 103 93 83 73 63 53 43 33 23 13 3 7
70 60 50 40 30 20 10

APPENDIX.

Tyler: city; capital of Smith co., Tex.; on the Int. and Gt. North. and the St. Louis S. W. (including the Tyler Southeastern) railways; 19 miles N. W. of Troup, 25 miles S. by E. of Mineola (for location, see map of Texas, ref. 3–J). It is in an agricultural region; is an important shipping-point for fruit and cotton; contains round-houses and machine-shops of the St. Louis S. W. Railway, a U. S. Government building (cost $85,000), county buildings (cost $75,000), city-hall (cost $25,000), 3 national banks with combined capital of $400,000, 6 churches, 2 public schools for white pupils and 1 for colored, 3 private schools for whites and 1 for colored, the Cotton-belt Hospital, public library, and 2 daily and 3 weekly newspapers; and has canning-factories, cotton-compress, fruit-tree nurseries, tile and pottery works, and iron rolling-mills. Pop. (1890) 6,908; (1900) 8,069.

Uhle, ALBRECHT BERNHARD: artist; b. in Chemnitz, Saxony, Oct. 15, 1847; was early taken to the U. S., receiving instruction in art from his father and at the Pennsylvania Academy; was engaged in photography 1867–75, in the latter year going to Munich, and to Italy in 1877, in which year he returned to Philadelphia and opened a studio, visiting Paris again in 1879, later becoming instructor of the portrait class at the Pennsylvania Academy. Among his portraits are those of Isaac Lea, Peter McCall, Joseph Leidy, Wayne MacVeagh, and John D. Lankenau.

Uitlanders, wĕĕt'laăn-ders (literally, outlanders or foreigners): the name given by the Boers of the Transvaal or SOUTH AFRICAN REPUBLIC (*q. v.*) to those whites who have lived in their country since the discovery of gold in 1886 in the De Kaap district of the Eastern Transvaal. The three other centers where Uitlanders are chiefly massed are northeast in the Zoutpansburg district; south in the Klerksdorp district, close to the Vaal river, where there are nearly 5,000 Europeans; and southwest in the Witwatersrand district, which has far outstripped the others. The vast majority are English-speaking persons, while the Dutch outnumber the French and Germans. Of this foreign element, numbering about 75,000, at least two-thirds are adult males. The Boers, on the other hand, number only about 25,000 adult males in a total Boer population of about 125,000. See WITWATERSRAND and AFRICA. C. C. A.

Ulrich, CHARLES FREDERICK: artist; b. in New York city, Oct. 18, 1858; studied art at Cooper Institute and the National Academy and afterward in Munich, where he gained a medal in 1879; followed his profession for several years in New York city, going to Italy in 1884; became an associate of the National Academy in 1883, and was awarded the Thomas B. Clarke prize for his *In the Land of Promise*. Among his noted pictures are *The Wood-Engraver*; *The Glass-Blowers*; *The Carpenter*; *A Dutch Typesetter*; *The Waifs*; and *Washing of Feet in the Venice Cathedral*.

United States: The success of the Republicans in electing McKinley seemed to call for an immediate treatment of the tariff question and the question of currency. Accordingly, only two days after the inauguration the President called a special meeting of Congress. In his message he directed attention to the fact that for some years the income of the Government had not equaled its expenses, and that he regarded it as very desirable that the tariff should be so modified as to meet the deficiency. The depression of industries, moreover, indicated a necessity that changes in the tariff should furnish further protection. In due time a bill was brought forward by Representative Dingley, of Maine, chairman of the committee on ways and means. The measure was less radical in many ways than the McKinley tariff of Harrison's administration; but after very careful and prolonged consideration it passed both houses and received the President's approval. Owing to the fact that changes in the direction of higher duties had been anticipated by the country at large, importers had filled their warehouses in the latter days of the old tariff, in order to secure the profits that would result from the anticipated rise in prices. The consequence of this course was a disappointment in the hopes of those who had expected the Dingley tariff at once to remove the deficiency. It was many months before the normal results ensued, and Congress deemed it necessary to supplement the income by placing an additional tax on beer and a few other articles.

Signs of business revival soon began to show themselves. The people of the country had so long lived in a very frugal way that as soon as the tariff question was settled business activity rapidly revived. Manufactories of all kinds were opened, prices and wages rose, and signs of prosperity soon became manifest everywhere. Within two years the bank clearances of the country showed a greater volume of business than they had ever done before. Money became abundant, and the current rates of interest were low. In this satisfactory condition of affairs a reform of the currency was almost lost sight of. During the first two years of McKinley's administration there seemed to be so general an acquiescence of satisfaction with the currency that no reform was seriously undertaken.

The Spanish War.—The condition of affairs in Cuba early attracted the attention of McKinley's administration. Centuries of misrule and consequent discontent had culminated in so much anarchy that interference on the part of the U. S. Government and people seemed to be called for. The Spanish method of ruling dependencies has always been one of extreme harshness, and Cuba in the W. and the Philippine islands in the E. have ever been conspicuous examples of bad government. In the course of the present century as many as ten organized efforts have been made to throw off the Spanish yoke in Cuba, the most energetic of them extending from 1868 to 1878, when the island was desolated and impoverished by a ten years' war. When, at length, it was over, the Spanish Government caused new difficulties by undertaking to reimburse itself for the expense of the war by additional taxation. It is said that the suppression of the rebellion cost the Spanish Government about a billion dollars, and the impoverished condition of the Cuban people made the payment of further taxes an impossibility. The consequence was an outbreak of a new and more thoroughly organized revolt in 1895. The authorities at first made little headway against it, and the Government at Madrid, concluding that Capt.-Gen. Campos, the governor of the island, was too gentle in his methods, superseded him by the appointment of Gen. Weyler, who as governor of the Philippines had acquired the name of "The Butcher." Weyler's methods in Cuba were those of extreme energy and cruelty. His plan was to reduce the insurgents by burning the houses and crops, and driving the starving population into villages surrounded with stockades and ditches known as *trochas*. Here starvation soon became general. Appeals from the leaders, however, found their way into the U. S., and an organization in New York known as "The Junta" furnished the press with details of the horrors to which Cubans were subjected. Direct appeals were also made to the Government during Cleveland's administration; but the effort was regarded as impertinent, and brought no relief. The newspapers throughout the country rang with denunciations, and people of all classes were deeply stirred by the revelation of horrors. Such was the state of Cuban affairs when Senator Proctor, of Vermont, determined to visit Cuba on a tour of inspection. The result of his visit, as reported in a speech in the U. S. Senate, thrilled the nation. He made it apparent that death by starvation at the present rate would soon depopulate the island. The *reconcentrados*, as the people penned within the *trochas* were called, were dying at an unprecedented

rate. Numerous statistics of an overwhelming nature were given. For example, in the little city of Santa Clara, with a population of only about 14,000, the number of deaths in 1897 was 6,981, while in the seven years previous to that time the total number of deaths, including the victims of an epidemic of yellow fever, was only 5,489.

It was while such terrible facts were becoming known that the U. S. battle-ship Maine visited the harbor of Havana on a call of international courtesy. The visit was made after due consultation with the Spanish minister at Washington, and the vessel was moored in a position assigned by the authorities of the harbor. The ship had been in position less than a month without having left the moorings, when, on Feb. 15, 1898, a terrible explosion occurred which destroyed the ship and caused the loss of 266 officers and men. The event was regarded with horror by the whole civilized world. Capt. Sigsbee, of the Maine, in his dispatch announcing the disaster, called for a suspense of judgment until the results of an investigation could be made known. The Government appointed a commission to examine witnesses and otherwise investigate the causes of the explosion, and this commission in due time reported that the ship had been destroyed by the explosion of a mine exterior to the vessel, and that the concussion had caused two of the magazines of the ship also to explode. The publication of this report caused all the slumbering fires of indignation in the country to burst out into flame. Flags suddenly flew out on every public building and on thousands of the schoolhouses in the country. In the theaters and *cafés* the presentation of the national flag or the singing of the *Star-Spangled Banner* caused such tumultuous outbursts of enthusiasm that there could be no mistaking the demands of the people. It was becoming more and more evident that the country was in advance of the Government in the ardor of determination. The President had personally learned the horrors of war, and was determined that every resource of diplomacy should be exhausted to secure the desired result without an appeal to arms. On his request, Weyler was recalled, but the changes made by the new captain-general were not enough to satisfy the reasonable demands of the country. Accordingly, on Mar. 8, McKinley asked Congress for an appropriation of $50,000,000 for national defenses, and Congress granted the appropriation without a dissenting vote. The coast defenses were at once strengthened, vessels and naval supplies were purchased in various parts of the world, and a large number of fast vessels were procured as an auxiliary fleet. On Apr. 11 the President sent a special message to Congress recounting the history of Cuban affairs, and declaring that in his opinion forcible interference would now be justified. Action by Congress declaring war was taken Apr. 19, the anniversary of the battles of Lexington and Concord. Accompanying this declaration was the statement that it was not the purpose of the U. S. to retain possession of Cuba. Within a week the President called for 200,000 volunteers and an increase of the regular army from 27,000 to 50,000 men.

The first great event of the war was in the far East. The Pacific fleet, in command of Commodore George Dewey, was in Eastern waters, with headquarters at Hongkong. Within a few days after the formal declaration of war the commander received notice from the Governor of Hongkong that, according to international requirements, the fleet of a nation at war could not remain in neutral waters. At the same time Dewey received orders from the President to proceed to Spanish waters about the Philippine islands and capture or destroy the Spanish fleet. Collecting the ships that were available, he soon set sail with a squadron consisting of the flag-ship Olympia, a second-class cruiser, with the smaller vessels, the Boston, the Baltimore, the Concord, the Raleigh, and the Petrel, with the McCulloch as a dispatch-boat, and two merchant vessels with coal. After an uneventful voyage of about 600 miles, the squadron arrived off the mouth of Manila Bay on the evening of Apr. 30. Besides strong fortifications at the mouth of the bay, there was a fort with its arsenal at Cavite, and there were numerous submerged torpedoes in the channel. The two fleets consisted of about the same number of cruisers, but the Spaniards had the advantage of a larger number of small craft, including torpedo-boats. At midnight the American ships were stripped for action and entered the mouth of the bay. Only a few shots were fired from the forts and these did not interrupt the progress. At daybreak the ships had reached Manila, a point nearly 30 miles from the mouth of the bay. Wheeling to the right, at 5.35 o'clock, when they had reached within 2 miles of the Spanish vessels before Cavite, the firing began. The American fleet slowly passed in front of the enemy, all the ships firing from their port batteries. The ships then swung around, using their starboard batteries, thus enabling the guns on the other side to cool. The American shots had terrific effect, while the Spanish shot and shell were wild and harmless. The Spanish flag-ship broke away from her moorings in desperation, and charged directly upon the Olympia; but her sides were torn open by shot and shell, and soon she was seen to be on fire and in a sinking condition. Two torpedo-boats which made a similar effort were speedily sunk. The Spaniards fought with the utmost desperation, and it was not till all their ships had been sunk or were on fire and the arsenal at Cavite had been exploded that the white flag was raised over the fort and the battle was at an end. The number of Spanish casualties has not been reported, but on the American fleet not a man was killed, and only seven were slightly wounded. The world heard the news with amazement, as no battle like it had ever been fought. The superiority of American ships, of American seamanship, and of American gunnery was at once the subject of universal comment and praise. Dewey became the great hero of the war, and Congress made haste to revive the grade of admiral, to which he was promptly promoted. With the Spanish fleet destroyed, Manila, the capital city of the islands, was easily taken, and the entire group of some 1,200 islands, with inhabitants variously estimated at from 6,000,000 to 9,000,000, soon fell under U. S. control.

As soon as the war broke out the President ordered the fleet at Key West to blockade the ports of Northern Cuba, and thus not only to prepare the way for an invasion of the island, but also to prevent the Spaniards from receiving supplies. Various unimportant attacks were made at several of the ports in order to keep the enemy from concentrating at the single point where the army was to land. It was decided to attack Santiago de Cuba, the capital city of the eastern part of the island, a decision which was reached not only on account of the intrinsic and strategic importance of the place, but also because Admiral Cervera, in command of a formidable Spanish fleet, had entered the Santiago harbor. This fleet consisted of five powerful armored cruisers, the Christobal Colon, the Infanta Maria Teresa, the Almirante Oquendo, the Vizcaya, and the Reina Mercedes. There were also three swift torpedo-boat destroyers. As soon as the rendezvous was made certain, Commodore Schley, with the battle-ships Massachusetts, Texas, and Iowa, the cruisers Brooklyn, Marblehead, Minneapolis, and Castine, and the torpedo-boat Dupont, appeared off the mouth of the bay. In a few days Rear-Admiral Sampson, with the flag-ship New York and the battle-ship Oregon, with the cruiser New Orleans and several smaller vessels and torpedo-boats, joined Schley and assumed command of the united fleets. The object now was to seal the fleet of Cervera within the harbor. With this end in view one of the most daring exploits of the war was undertaken. It was thought that the channel could be closed by the sinking of a large coaling-ship in the mouth of the harbor, provided, under the fire of the forts, it could be swung around and sunk across the channel. The matter was undertaken by Lieut. Hobson and six men specially selected for the work. More than a hundred men volunteered and begged to be taken on this enterprise of extraordinary danger. The coaling-ship Merrimac, chosen for the purpose, reached the desired point, notwithstanding the shot and shell that were poured upon her from the forts. But her rudder was shot away and consequently it was impossible to turn her across the channel. The ship was sunk by torpedoes arranged along her sides and exploded by electricity. Hobson and his six companions escaped on a raft and were picked up, as by a miracle, unhurt. Though this heroic deed was not in all respects successful, it raised an obscure officer to the summit of fame.

On June 14 Gen. Shafter, in command of the military expedition against Santiago, set out from Key West with 16,000 men on board 35 transports, and under the protection of 14 armed vessels of the navy. After six days they arrived off Morro Castle at the mouth of the bay, and a little later the force landed at Daiquiri, 15 miles E. of Santiago. The advance was not delayed. Though there were no roads but bridle-paths, Gen. Shafter decided to push rapidly forward and to make the campaign as short as possible in order to avoid the fatal effects of the climate.

The first engagement was at Guasimas, two days after landing, where the Spaniards were vigorously driven back, chiefly by the First U. S. Volunteer Cavalry, commonly known as the Rough Riders, under Col. Wood and Lieut.-Col. Roosevelt. Pushing rapidly forward E. and N. of the city, the army was confronted with strong fortifications at El Caney and San Juan. A general advance was ordered for June 30. Gen. Lawton's division carried El Caney July 1 with the greatest gallantry, and this was succeeded by the storming of San Juan under Gen. Kent and Gen. Wheeler. Both of these exploits were thought by many of the military experts to be impossible, as the difficulties of assault had been enormously increased by the fact that the country in front of the forts had been covered with an intricate network of barbed-wire fences. These all had to be cut under the murderous fire of the enemy. The Americans killed numbered 230; the wounded 1,284. On the evening of July 1 the American lines were within 5 miles of the city.

When it became evident that the city must be taken, the Spanish Government ordered Cervera to attempt an escape. The desperate effort was made July 3. At about 10 o'clock in the morning the first of the Spanish fleet, quickly followed by the others, appeared in the mouth of the harbor. Admiral Sampson had sailed eastward for an interview with Gen. Shafter at Siboney, but he had left orders with the fleet as to the course to be taken in case the Spanish fleet should appear. These orders were strictly carried out by Commodore Schley, the second in command. As the Spanish fleet, on emerging from the bay, turned westward to escape, they were subjected to a terrific fire from the American battle-ships and cruisers. In a few minutes the Maria Teresa and the Oquendo were on fire. The torpedo-boats then came out with all their speed, but so furiously were they riddled by the unerring shot of the American guns that they were soon disabled and sunk. Of 140 men on these vessels only 24 survived. The converted yacht Gloucester, under command of Lieut. Wainwright, fought the torpedo-boats with extraordinary gallantry and contributed greatly to their speedy destruction. The Oquendo after being hit sixty-six times gave up the fight and ran on shore. The Vizcaya, also on fire, soon did likewise. The Colon pushed her way out of the thickest of the engagement, and, having more speed than the others, attempted to escape. But pursuit at once began by the Brooklyn, the Oregon, the Texas, and the Vixen. Though the Spanish ship succeeded in running 42 miles, she was at length overtaken and was obliged to surrender after a terrible cannonade. Admiral Sampson arrived with the New York just at the close of the battle. All the men alive on the Spanish fleet were taken prisoners, the admiral and many other officers among the number. The Americans lost but one man, while the killed of the Spaniards numbered about 400. The complete destruction of Cervera's fleet led to the immediate surrender of Santiago and the close of the war. It is worthy of note that the conduct of Admiral Cervera had been such as to cause universal admiration. He had not only lifted Hobson out of the water with his own hands, but he had at once sent word to Admiral Sampson that Hobson's crew were safe, and that in recognition of their gallantry they would be specially cared for as prisoners. The dignified and admirable bearing of Cervera after his fleet was destroyed did much to awaken sympathy for an officer whom the fate of war had overwhelmed. Before the final event, however, another important campaign had taken place. As soon as it became certain that the surrender of Santiago was assured, Gen. Nelson A. Miles organized a force to take possession of the island of Puerto Rico. Contrary to all expectations, his force landed at Ponce, on the south side of the island, and met with very little resistance. He immediately organized an aggressive campaign and advanced rapidly toward San Juan, the capital city, on the north coast. Just before the last overwhelming attack was to be made news came that the preliminaries of peace had been signed and that hostilities were suspended.

Soon after the destruction of Cervera's fleet the French minister at Washington presented a note to the President in behalf of the Spanish Government, asking the terms on which the U. S. would be willing to make peace. After various delays preliminaries were agreed to and signed on Aug. 12. President McKinley at once issued a proclamation suspending hostilities. The most important conditions on which the war should cease were embodied in the protocol; but the details were to be arranged by a joint commission consisting of not more than five representatives of the U. S. Government and the same number from the Government at Madrid. According to the preliminary agreement, Spain was to abandon all right to Cuba; Puerto Rico was to be ceded to the U. S.; Spain was to grant to the U. S. one of the Caroline islands, to be selected by the commission, and the commission in the final treaty was to determine the future status of the Philippine islands. These conditions were duly amplified and formulated by the ten commissioners in the Treaty of Paris, which was ratified by the U. S. on Feb. 6, 1899, and by Spain on Mar. 17. By the terms of the final treaty the Philippine islands passed to the U. S. in consideration of the payment of $20,000,000, and the island of Guam was selected as the representative of the Carolines in the Pacific.

In the course of the war public opinion had come to favor the accession of Hawaii, very largely for military and naval reasons. As soon as it became probable that the Philippine islands would be retained by the U. S. it became obvious that there would be many strategic advantages in the possession of the Hawaiian islands. Accordingly, on the recommendation of the President, Congress adopted a resolution acceding to the petition of the Hawaiian Government, annexing the islands to the U. S. A precedent for this method of procedure had been furnished at the time of the annexation of Texas.

Unfortunately, war did not close with the signing of the treaty of peace. The condition of the Philippine islands was the cause of not a little anxiety. The natives had been in revolt against the Spanish Government when the war broke out, and when Spanish authority was overthrown the party in rebellion was unwilling to yield to the authority of the U. S. Aguinaldo, the leader of the revolutionists, insisted upon independence. This the U. S. Government was not willing to grant, although it gave most formal assurances that the political and civil rights of the natives would be fully respected. The Government could not be brought to believe that the Filipinos were at present fitted for self-government. It was evident that, if abandoned, they would fall into anarchy and under military despotism. But the assurances of President McKinley were not satisfactory to the military dictator, Aguinaldo, and on Feb. 4, 1899, his troops attacked the American lines in the suburbs of Manila. Not till early in 1900 was the organized insurrection broken up, and even after that time fighting was continued by small bands in the more inaccessible parts of the island of Luzon. Aguinaldo was captured Mar. 23, 1901, by Gen. Funston and taken to Manila. On Apr. 2 he took the oath of allegiance to the U. S., and published a proclamation advising his followers to lay down their arms. In the meantime a commission appointed by the U. S. had established local native governments in many places in the islands, and had introduced many needed reforms in the sanitary, educational, and religious systems.

In 1900 President McKinley was re-elected on practically the same issues as in 1896. The candidates, together with the political parties nominating them and the popular vote received, were as follows: McKinley, Republican (7,208,244); Bryan, Democratic (6,358,789); Woolley, Prohibition (209,936); Debs, Social Democrat (85,971); Maloney, Socialist Labor (49,699); Barker, Middle-of-the-Road Populist (50,373); Ellis, Union Reform (5,698); and Leonard, United Christian (1,060). Mr. McKinley received 292 electoral votes, Mr. Bryan, 155.

On June 1, 1900, the twelfth census of the U. S. was taken. The population (exclusive of 129,518 Indians, not taxed) according to the official count was 76,303,387, an increase of 12,937,008, or 20·7 per cent. over that of 1890. The average density of population per sq. mile was 25·6. The center of population is computed to be at a point 6 miles southeast of Columbus, Ind., in lat. 39° 9′ 36″ N., and lon. 85° 48′ 54″ W., having moved 14 miles westward during the decade. Of the total population 28,411,698, or 37·3 per cent., lived in the 1,158 cities of 4,000 inhabitants or more. There were 19 cities with more than 200,000 inhabitants, 38 with more than 100,000, 78 with more than 50,000, and 161 with more than 25,000.

C. K. Adams.

Uranium or **Becquerel Rays**: an invisible radiation from uranium and its compounds, able to penetrate through most opaque substances. They have the property of affecting photographic plates, discharging electrified bodies, and all the other properties that Röntgen rays have. These are usually called Becquerel rays, after the name of their discoverer.

The discovery of Röntgen rays and the use of fluorescent

screens with them aroused a great interest in fluorescence and phosphorescence. This increased interest and the use of fluorescent and phosphorescent screens with photographic plates led to the discovery that some of these chemicals emitted a sort of invisible radiation. A good deal of the work that has been done with the radiation from fluorescent salts has been done with the aid of photography. It is well to state that photographic results are often misleading. Many cases where a radiation was supposed to exist can be explained by a chemical effect, either direct or resulting from the vapors given off by the salt when laid on or near the photographic plate. While no doubt exists now about the existence of a radiation from uranium, there is considerable doubt about many of the other apparent radiations.

In the early part of Feb., 1896, Charles Henry published in the *Comptes Rendus* the statement that sulphide of zinc augmented the photographic effect of light and Röntgen rays. He claimed to have found that if he covered an object with this sulphide the photographic effect of Röntgen rays was increased, showing that bodies partially opaque to Röntgen rays became less so when covered with this zinc sulphide. He found that this sulphide when exposed to magnesium light or daylight apparently gave a radiation which would affect a photographic plate through black cardboard and aluminium. For diffused daylight the exposure was from three to five hours. A week later Niewenglowski published the statement that commercial sulphide of calcium emitted radiations which traversed opaque bodies. Henry Becquerel, of the Conservatoire des Arts et Métiers in Paris, two weeks later than Henry announced (*Comptes Rendus*, cxxii., page 420) that this statement might be extended to other phosphorescent bodies, in particular to the salts of uranium. He wrapped a photographic plate with two thicknesses of heavy black paper, so that the plate was not fogged by an exposure to the sun for a day. He placed on the sheet of paper the phosphorescent material, double sulphate of uranium and potassium, and exposed it to sunlight for some hours. On developing the plate a silhouette of the substance appeared in black on the negative. When a coin or any metallic screen was interposed, shadows of these appeared on the plate. The effect was still obtained when a piece of glass was interposed between the plate and the salt. The glass plate would in this case prevent any chemical action which the vapors of the salt might have on the photographic plate.

Becquerel at first thought that the effect was due to a sort of fluorescence or phosphorescence and that it was necessary to expose the salt to light. But the radiation persisted even in a dark room and freshly prepared salts which had not been exposed to light gave the same radiation. Later he* found that the metal uranium gave a radiation about four times as intense as that he had obtained from any of the salts he had used.

It was found that the following substances were rather transparent to the radiation from the salts of uranium: Water; most solutions, even of metallic salts, such as copper nitrate, chloride of gold, and nitrate of uranium; an alcoholic solution of chlorophyll; paraffin; quartz; Iceland spar; and sulphur. Quartz is more opaque than Iceland spar. Uranium glass, a red glass, and a blue cobalt glass were more opaque. Copper was nearly as transparent as aluminium. Platinum of about one-third the thickness of a sheet of aluminium was about as transparent. Air was found to absorb the radiation slightly. As the absorption of Röntgen rays by a given substance varies with the source of the rays—that is, with the kind of vacuum tube used—it is not possible to compare accurately the absorption of the two kinds of rays. With the Röntgen-ray tube he used Becquerel thought that the metals in general were more transparent to uranium rays.

Becquerel thought that he proved that uranium rays could be reflected, refracted, and polarized. It is these properties which distinguish light and other transverse ether-waves from all other kinds of radiation. If, as he thought, uranium rays can be reflected, refracted, and polarized, then they must be short transverse ether-waves differing from light-waves in their wave-length only. They would then belong to the ultra-violet part of the spectrum. But no one has been able to repeat these experiments. Rutherford (*Philosophical Magazine*, Jan., 1899), in an attempt to repeat these experiments, obtained only negative results.

* Becquerel's results are given in a large number of short articles in vols. cxxii., cxxiii., cxxiv., cxxviii. of the *Comptes Rendus*. For a detailed abstract see *Physical Review*, vol. vi., p. 239, 1898.

Nearly three years after he had announced that he had found that these rays could be reflected, refracted, and polarized, Becquerel admitted (*Comptes Rendus*, Mar. 27, 1899) that he had been unable to verify these experiments and that he had probably been mistaken. He claimed, however, to have found that these rays, like Röntgen rays, could be diffusely reflected.

Becquerel found that, like Röntgen rays and ultra-violet light, uranium rays would discharge an electrified body. The discharge differs from ultra-violet light in that while Röntgen rays and uranium rays will discharge both positively and negatively electrified bodies, ultra-violet light will discharge only negatively charged bodies. It was found that it was not necessary for the rays to fall upon the charged body, but that they, like Röntgen rays, would make the gas through which the rays passed a conductor, and that this gas if brought near a charged body would discharge it. Metallic uranium would not hold a charge unless it was kept in a vacuum. The discharge of electrified bodies by uranium rays, its variation with the pressure of the surrounding gas, and its other properties have been investigated by Becquerel, Beattie and Smoluchowski de Smolan (*Philosophical Magazine*, xliii., p. 418; xliv., p. 102, and xlv., p. 277; *Nature*, lv., p. 447, also lvi., p. 20), and Rutherford (*Phil. Mag.*, xlvii., p. 109, 1899). The phenomena are practically the same as those observed with Röntgen rays.

A gas which has been made a conductor for electric charges by Röntgen rays or by uranium is not a conductor in the ordinary sense. It does not obey Ohm's law, but behaves in every way like a very dilute electrolyte. According to the theory suggested by Giese and Schuster and developed by J. J. Thomson and Rutherford (*Phil. Mag.*, xlii., p. 392, and xlvii., p. 253), the gas is in some way broken up into "ions" which can carry electrical charges, some carrying positive and others negative charges. A charged body placed in the "ionized" gas would attract one kind of ions and repel the other. Upon coming in contact with the charged body the ions are supposed to give up their charges and cease to exist as ions. These ions under the influence of an electric field will move with a velocity proportional to the intensity of the field. Rutherford has found that the negatively charged ion moves in air with a velocity greater than that of the positively charged ion, and that the ions produced by uranium rays in a given gas at a given pressure have the same velocity for the same electric field as those produced by Röntgen rays.

Wilson (*Proc. Phil. Soc., Camb.*, ix., p. 333) has shown that, like the ions produced by Röntgen rays, these ions will act as nuclei for the condensation of water-vapor in supersaturated dust-free air. In this way it is possible to form clouds which are plainly visible. Borgman (*Comptes Rendus*, cxxiv., p. 895) found that Röntgen rays and uranium rays would excite thermo-luminescence in some substances, especially in a mixture of calcium and manganese sulphates. It required an exposure of nearly six days for the uranium rays to excite the thermo-luminescence strongly. P. Spies (*Beiblätter*, p. 67, 1897) and F. Maack (*Beiblätter*, p. 366, 1897) found that while uranium rays would not produce a visible fluorescence, they would produce a fluorescence that could be detected photographically.

The source of energy of these rays is at present unknown. Becquerel found that some uranium salts that had been sealed in glass tubes and kept in boxes of lead, where all known radiation except from the sides of the box was excluded, continued giving out these rays. During the first few months the intensity fell off slightly and after that appeared to be constant. After nearly three years the salts continue to give off these rays, and how much longer they will continue is not known. Elster and Geitel (*Wiedemann's Annalen*, lxvi., p. 735, 1898) found that the radiation was still emitted when the uranium was placed in a vacuum. As there is a possibility of the rays being excited by some kind of radiation hitherto unnoticed, which could penetrate most substances, Elster and Geitel took the uranium into a deep mine where any such radiation would have had to penetrate nearly 3,000 feet of earth. But the radiation still existed.

Becquerel found that radiation was not homogeneous, and Rutherford (*Philosophical Magazine*, Jan., 1899) continuing the investigation found that the radiation consists of two kinds of rays, α rays and β rays, as he calls them. The α rays seem to come from the surface and to increase in intensity with an increase of surface. They are more easily absorbed by substances and have a greater effect in producing ionization of

gases. The β rays have a greater penetrative power and greater photographic action than the α rays and appear to be homogeneous.

M. and Mme. P. Curie and G. C. Schmidt almost simultaneously discovered that thorium and its compounds give a radiation similar to uranium rays. Schmidt (*Wiedemann's Annalen*, lxv., p. 141) tried experiments similar to those of Becquerel to show reflection, refraction, and polarization of thorium rays. He could not find any traces of polarization, but thought he found reflection and refraction. He found that thorium rays discharged electrified bodies in the same way that uranium rays did. It is very probable (see Rutherford, *l. c.*) that thorium and uranium rays are the same. As the atomic weights of the thorium and uranium are greater than that of any other element, it has been suggested that there is some relation between this radiation and the high atomic weight. M. and Mme. Curie (*Comptes Rendus*, cxxvi., pp. 1101 and 1264, cxxvii., pp. 175 and 1215) found that pitchblende (oxide of uranium) gave a greater intensity of radiation than could be accounted for by the small amount of uranium present. They were able to separate by chemical processes from the pitchblende two substances which they regard as elements and to which they gave the names *polonium* and *radium*. These so-called elements give rays very intense as compared with those from uranium and thorium. The radiations from uranium, thorium, polonium, and radium differ in their penetrative power. But such a difference might be expected. Röntgen rays from different tubes present the same differences. If the rays are a wave-motion, difference in wave-length alone would readily explain it. The existence of polonium and radium as elements is not as yet generally accepted.

Similar radiations apparently exist from other substances, particularly fluorescent materials such as zinc sulphate and calcium sulphide, but as yet the radiation from these has not been investigated enough to enable us to know much about their properties. The radiation is probably different from the radiation from uranium and thorium. Owing to the fact that the vapors from many of these salts will penetrate black paper and affect photographic films, in some cases it is still doubtful whether it is a genuine radiation.

Nothing can be stated definitely as to what uranium rays are. They have all the properties that Röntgen rays possess, such as photographic action, exciting fluorescence, making a gas an electrical conductor, augmenting the formation of fogs, and exciting thermo-luminescence. In every case the similarity is very striking. So far as observation has gone they appear to differ from Röntgen rays only in intensity. From all the experimental evidence at hand uranium rays and Röntgen rays would seem to be either the same or very closely related. On the other hand, there are no theoretical reasons for their identity. The theory of Röntgen rays which seems now to be gaining the most headway is that the rays are ether-impulses. No explanation has been given of how ether-impulses could start from uranium. However, the fact that so far as is known the two kinds of rays produce the same effects does not prove their identity.

If uranium rays could be reflected, refracted, and polarized there would be no doubt but that they were short ultra-violet rays. On the other hand, if these rays can not be reflected, refracted, or polarized it does not follow that they are not short ultra-violet rays. Very short rays according to our dispersion theories can not be reflected or refracted, and probably not polarized. So there still remains the possibility that they are very short ultra-violet rays. The same is true of Röntgen rays. The theory that uranium rays and Röntgen rays are very short ultra-violet light-rays is by no means abandoned; but from our present state of knowledge we are not warranted in drawing any definite conclusions about the nature of uranium rays. O. M. Stewart.

Uruguay: In 1898 U. S. coal first entered the river Plate in successful competition with Welsh coal. In four months after the end of the Spanish-American war Uruguay sent to Cuba 4,171,228 lb. of jerked beef. The main elements lacking to make the country prosperous are peace and population. In eighteen years the growth of population has been scarcely 100,000. The last revolution of 1897 greatly interfered with industry and commerce, and the external trade fell off about 50 per cent.

Vacation Schools: schools that have sessions during the customary long vacation. Vacation schools are a recent development of modern urban life. The long summer vacation in the country is a welcome relief from school discipline, giving the children opportunity for free contact with nature during the period of the year when nature is at its best and school work is most difficult; but this long vacation in crowded city tenement districts has been for some time regarded with suspicion, if not with positive disapproval. In the poorer districts of the city the school offers to the child the most attractive and delightful opportunities and the best influences that enter its life; its social environment outside of school is at best negative in its character and frequently strongly detrimental to all the better influences that the school exerts. So far from offering to the pupils joyous relief from school duties, the hot city streets only afford a splendid school in disorder, immorality, and even crime. The closing of the schools for the long summer periods in the cities therefore not only closes to the children the healthful and attractive surroundings afforded by the schoolroom, but forces them into the harmful associations of the streets. As an illustration of this fact, it may be mentioned that in one district of Chicago the arrests of juvenile offenders increased 60 per cent. during the vacation period.

This evil was recognized as long ago as 1872, when the school committee in Cambridge, Mass., urged "the need of providing occupation for those children whose natural guardians are unable to do so. For two months in the summer the schools are closed. The scholars who can be taken into the country profit by the vacation, but it is a time of idleness, often of crime, with many who are left alone in the street, with no friendly hand to guide them save that of the police. Our city needs vacation schools, in which the hours and methods of study should be adapted to the season." The first vacation school was established in Boston in 1885. In 1894 the Association for the Improvement of the Poor, in New York, secured the use of four public-school buildings and began the vacation-school movement. In Cleveland similar work was begun in 1897, and also in Brooklyn in the same year. Cambridge, which early recognized the need, did not begin the work until this year also. In 1898 the board of education in Philadelphia opened three vacation schools on an unusually liberal basis as an experiment. Work was begun in Baltimore in the same year. Chicago undertook the work, in a preliminary way, in 1896, and has carried it on since that time. It was from the first believed that the vacation schools should be supported by the boards of education of the several cities as a part of the public-school system, but so far this step has been taken only in New York. The other enterprises have been carried on by private benevolence, largely with the purpose of demonstrating the high value of such schools, to the end that the board of education might recognize their importance and support them from public funds. The credit of starting the schools and raising the funds for their maintenance belongs almost exclusively to women, though the actual direction of the schools has been confided, in most instances, to professional educators.

Fundamentally, the vacation-school movement rests upon the principle of providing employment for children in crowded sections of great cities during the otherwise idle summer months. Some differences of opinion have arisen as to the nature of this employment. In general there are three types of vacation schools advocated, all of them exemplified more or less in practice. The first type is what may be called the continuation school. The object of this school is to furnish an opportunity during the summer for pupils who have fallen behind in their work to "make up" and enter school in the fall in full standing in their several grades. The subjects of study, therefore, are essentially the same as those of the curriculum of the regular school period, though there is much additional work in the way of manual training and nature-study. It is also urged that schools of this type enable poor children who must leave school at an early age to attend throughout the year, and thus gain more school benefit in the limited number of years at their disposal than would be possible if their work were interrupted for three months each year. These arguments have appealed with some force to boards of education, but this type of vacation-school work has not been generally adopted in the schools thus far established. The second type is the industrial type, which has been specially exemplified in the Brooklyn vacation schools, where the course of study includes carpentry, chair-caning, basket-weaving, cobbling, sewing, drawing, modeling, water-colors, and kindergarten. To these occupations Boston adds sloyd, leather-work, typesetting, cooking, and fancy work. The

third type of vacation school may be called the educative type, and is based on principles of education rather than of instruction. The course of study is made to give additional culture and development rather than specific technical skill in hand work. Schools of this type, which have been most extensively developed in Chicago, introduce as a special feature of the course a weekly excursion of all the children to the country. These excursions are not picnics, but educational pilgrimages under the direction of the teachers. Instruction is given mainly in nature-study, and the work of the remainder of the week is correlated with the experiences gained on the excursion. A typical programme of work for a school of this kind is the following from Chicago schools:

Class	Time, 9–9.40.	Time, 9.45–10.25.	Time, 10.30–11.10.	Time, 11.15–11.55.
	Subject.	Subject.	Subject.	Subject.
A¹	Nature-study	Drawing	Music or gymnastics	Boys, manual training Girls, sewing
A²	Nature-study	Drawing	Music or gymnastics	Boys, manual training Girls, sewing
B¹	Drawing	Music or gymnastics	Boys, manual training Girls, sewing	Nature-study
B²	Drawing	Music or gymnastics	Boys, manual training Girls, sewing	Nature-study
C¹	Music or gymnastics	Boys, manual training Girls, sewing	Nature-study	Drawing
C²	Music or gymnastics	Boys, manual training Girls, sewing	Nature-study	Drawing
D¹	Boys, manual training Girls, sewing	Nature-study	Drawing	Music or gymnastics
D²	Boys, manual training Girls, sewing	Nature-study	Drawing	Music or gymnastics

So far the applications for admission to these vacation schools have been largely in excess of the accommodations that could be furnished. The testimony of all who have engaged in or observed the work is unanimous and emphatic as to its success and value.

Closely connected with the vacation-school movement is the playground movement. A place for play is one of the essential rights of childhood, and yet it is a right for which the modern city has made no provision. The school yards and basements offer excellent places for play, and in many sections of the large cities about the only available places. In several of the large cities arrangements have been made to have the school playgrounds open during the vacation period, suitable persons being provided to supervise the play and prevent damage to property. In Chicago the city council has made an appropriation for the maintenance of these playgrounds, and thus, in all probability, incorporated them in the permanent list of interests provided for at the public expense. Boston has recently made extensive provision for a comprehensive system of playgrounds for the city, and is expending a large amount of money to equip them with suitable apparatus. New York has begun a movement for small parks. Most European cities are ahead of American cities in this respect. The general custom there is to set aside, even in the large parks, special places for the children to play, to equip them with suitable apparatus, and place them under expert supervision. The provision of suitable playgrounds for children—not only in large cities, but throughout the country—is a matter of great educational importance. The opening of the school-grounds in the crowded city districts is an important step, which should be followed by an ample provision of small parks throughout all the sections of the city. See *American Journal of Sociology*, Aug. and Nov., 1898.

C. H. Thurber.

Vail, Alfred: inventor; b. in Morristown, N. J., Sept. 25, 1807; eldest son of Judge Stephen Vail, owner of the Speedwell iron-works at Speedwell, N. J., where the machinery of the Savannah, the first steamship to cross the Atlantic, as well as the first cotton-gin and the machinery of other early inventions, were made. Alfred was educated at the Morris Academy, and in 1825 entered the iron-works at the request of his father, in order to familiarize himself with the business, of which it was intended he should later assume control. His surroundings being uncongenial, and possessing a decided fondness for study, he withdrew from the works and entered the University of the City of New York, where he graduated in 1836. It was his intention to take up special studies in order to prepare himself for the Presbyterian ministry, but while at the university he became acquainted with Prof. Samuel F. B. Morse, and was so impressed with the possibilities of the use of electricity for the transmission of messages that on Sept. 23, 1837, he entered into a contract of partnership with Morse in invention, for the perfection of which he agreed to furnish money for further experiments, to obtain patents, and to devote himself, his skill, and his genius to the success of the invention. On Jan. 6, 1838, the first successful transmission of a message over the new apparatus devised by Vail, which took the place of the original appliances of Morse, then discarded, was successfully effected, the message being "A patient waiter is no loser." Later in the same month Vail devised the important improvements which have since been known as the "Morse system," including the dot-and-dash alphabet, recording receiver, and transmitting key. Soon after this the invention was taken to Washington and exhibited before Congress, and on Mar. 3, 1843, that body passed a bill appropriating $30,000 for the construction of an experimental line from Washington to Baltimore. Morse received the appointment of superintendent of Government telegraphs, and Vail was made assistant superintendent. The line was completed, and on May 24, 1844, it was opened by the transmission of the historic message from Washington to Baltimore, "What hath God wrought!" Litigation with infringers of the patents followed, which continued until after the death of Vail, thus preventing him from establishing his claim of being the inventor of the "Morse system." In 1849 he returned to Morristown, where he resided until his death, Jan. 18, 1859. He was the author of *The American Electro-Magnetic Telegraph* (Philadelphia, 1845).

Marcus Benjamin.

Valda, Giulia: the professional name of Miss Julia Wheelock; b. in Boston, Mass., and when fifteen years old began the study of music on the advice of Madame Parepa-Rosa, at first at home and later in Milan, under Lamperti. Her first appearance in opera was in Aug., 1879, in Pavia. She was then engaged in Milan, Bologna, Rome, and in 1884 in Paris. She appeared in London June 5, 1886. After this engagement she returned to the U. S. and sang in operas and concerts and the Worcester Music Festival. She was married to Mr. E. S. Cameron, from whom she obtained a divorce in 1889. She resides in New York. D. E. Hervey.

Vandewater, George Roe, D. D.: clergyman; b. in Flushing, N. Y., Apr. 25, 1854; graduated at Cornell in 1874, and at the General Theological Seminary in New York city in 1879, when he was ordained to the priesthood; was rector of the Protestant Episcopal church at Oyster Bay, Long Island, 1878–80, where he was instrumental in building a church and founding a library; became rector of St. Luke's church, Brooklyn, organized the congregation and church of St. Bartholomew, and was instrumental in organizing the Parochial Mission Society; conducted missions at various places successfully, and in 1887 was appointed general missioner of the Parochial Mission Society of the Episcopal Church; became rector of St. Andrew's, New York city, in 1888; is actively identified with the cathedral and the cathedral schools in Garden City, L. I., and is a trustee of Cornell and of the General Theological Seminary, received the degree of D. D. from Neshotah Seminary in 1886. He has published *Manual of Church Music* (1886); *The Hymn-Book for Missions* (1887); and *Manual of Church Prayer* (1888).

Van Dyck, Cornelius Van Alen, M. D., D. D., LL. D., L. H. D.: Protestant missionary; b. in Kinderhook, N. Y., Aug. 13, 1818; educated at the Kinderhook Academy; graduated in medicine in the Jefferson Medical College, Philadelphia, 1839; was appointed medical missionary of the American Board in Syria and Palestine, and the next year began his work in the East. He showed wonderful capacity for acquiring the Arabic language, and toiled on until he was absolute master of it. In 1846 he was ordained. In 1857 he took up the work Eli Smith had laid down at death,

and after eight years of strenuous labor completed the translation of the entire Bible into Arabic. In 1866 and 1867 he was in New York superintending the printing of it by the American Bible Society, and during this time gave instruction in Hebrew in Union Theological Seminary. His home in Syria was at Arbeih from 1843 to 1851, then for six years in the Sidon station, but from 1857 till his death in Beyrout. He was physician to St. John's Hospital and Professor of Pathology in the Syrian Protestant College 1867–82; then resigned and became physician to St. George's Hospital. While his translation of the Bible is his great monument, his mastery of Arabic is exhibited in numerous translations and original works in that language. These were mostly school and college text-books; but among them are translations of the *Schönberg-Cotta Family* (1885) and *Ben Hur* (1895). His knowledge of Arabic writers was enormous, and he was easy victor in many a literary contest with native Arabic scholars. He died of typhoid fever at Beyrout, Nov. 13, 1895. S. M. J.

Van Dyck, Ernst: singer; b. in Antwerp, Apr. 2, 1861, the son of a manufacturer. He first entered the Jesuit College there, then the University of Louvain, and took his degree of doctor of laws in the University of Brussels. But music proved a superior attraction, and in 1882 he went to Paris, where he discovered that he had a powerful tenor voice. In June, 1883, he made his first appearance. He appeared as Parsifal in Bayreuth in 1888, and as Lohengrin in Vienna in October of the same year. He has sung frequently in Paris and London, and in 1898 was engaged for the New York opera season. He has written several dramatic works. D. E. Hervey.

Van Hise, Charles Richard: geologist; b. in Fulton, Wis., May 29, 1857; graduated at the University of Wisconsin in 1879, and became instructor in metallurgy there, which place he held until 1883, when he was made assistant professor of that branch, and in 1886 advanced to the full professorship. Since 1888 his chair has been that of Geology, and since 1892 he has been a non-resident Professor of Structural Geology in the University of Chicago. Prof. Van Hise became an assistant on the Wisconsin Geological Survey in 1881, and in 1883 was appointed an assistant geologist on the U. S. Geological Survey, which place he then held until 1888, when he was given charge of the Lake Superior division of the U. S. Geological Survey. He has especially devoted himself to the study of the following geological problems: Elucidation of the stratigraphy of the North American pre-Cambrian formations; development of the principles of the deformation of rocks; and discovery of principles of concentration and occurrence of iron ore deposits of the Lake Superior region. Prof. Van Hise has been one of the editors of the *Journal of Geology* since its foundation in 1893. He is the author of numerous scientific papers contained in the *American Journal of Science*, the *Bulletin of the Geological Society of America*, and the *Journal of Geology*, in addition to which he has published the following larger memoirs: With Roland D. Irving, *On Secondary Enlargements of Mineral Fragments in Certain Rocks* (Washington, 1884); with Roland D. Irving, *The Penokee-Gogebic Iron-bearing Series of Michigan and Wisconsin* (1892); *Correlation Papers, Archean and Algonkian* (1892); *Principles of North American Pre-Cambrian Geology* (1896); and with W. S. Bayley and H. L. Smyth, *The Marquette Iron-bearing District of Michigan* (1897).
Marcus Benjamin.

Van Horne, Sir William Cornelius: b. in Joliet, Ill., Feb. 3, 1843; began work as an office-boy in a railway station, and rose in the service until in 1872 he became general superintendent of the St. Louis, Kansas City and Northern Railway. He held in turn the same office on the Southern Minnesota Railway, the Chicago and Alton Railway, and the Chicago, Milwaukee and St. Paul Railway. In 1880 he resigned this last position to become general manager of the Canadian Pacific Railway, which was then being planned. In 1888 he became president of the company, which position he still holds. In May, 1889, he was made honorary K. C. M. G. by Queen Victoria.

Van Liew, Charles Cecil, Ph. D.: educator; b. in Aurora, Ill., Feb. 15, 1862: educated in the public schools of Aurora, and in the universities of Leipzig and Jena; Ph. D., Jena, 1893; principal, Bensenville, Ill., 1886–90; Professor of History and Psychology, State Normal School, St. Cloud Minn., 1893; Professor of Reading and Pedagogy, Illinois State Normal University, Normal, Ill., 1894–96, and supervisor of training 1896–97; head of the department of psychology and pedagogy and supervisor of training, State Normal School, Los Angeles, Cal., since 1897; translator of Ziehen's *Introduction to Physiological Psychology* and Rein's *Outlines of Pedagogics*; author of *Phonics and Reading*, and of numerous articles in educational journals.

Van Rooy, Anton: singer; b. in Rotterdam, Holland, Jan. 1, 1870. When seven years old he sang in a church choir in Rotterdam. After his boy's voice broke he pursued a business career for a time, and then studied for four years with Stockhausen in Frankfort-on-the-Main. Having developed a fine bass voice, he sang in concerts and oratorios in the leading German cities, and Mme. Wagner invited him to sing at Bayreuth. He sang the parts of Wotan, Wolfram, and Kurwenal. His success was so great that he was engaged for London, and in the season of 1898–99 he was one of the company at the Metropolitan Opera-house, New York, and in addition gave several song recitals. D. E. Hervey.

Van't Hoff, Jacobus Hendricus, Ph. D.: physical chemist; b. in Rotterdam, Aug. 30, 1852, the son of a physician; educated at the Polytechnic School in Delft and at the Universities of Leyden, Bonn, Paris, and Utrecht. In 1874 he received the degree of doctor of philosophy from Utrecht University. He became a docent in the veterinary college of Utrecht in 1876. In 1878 he was appointed Professor of Chemistry, Mineralogy, and Geology at the University of Amsterdam, which position he filled until 1895, when he became Professor of Physics in the University of Berlin and director of the Physical Institute at Charlottenburg. He is the author of numerous papers on physical chemistry, especially on the mathematics of that science. In 1898 he published the first part of his treatise on *Physical Chemistry*, a volume devoted to the dynamics of the subject.
E. L. N.

Van Wyck, Robert Anderson: lawyer; b. in New York city, July 20, 1849: graduated at Columbia Law School 1872; elected judge of the city court of New York city and subsequently made its chief justice, and held this position until his resignation in 1897. He was elected mayor of New York in 1897, at the first election after the adoption of the new charter of the city.

Vaux, Richard: lawyer; b. in Philadelphia, Dec. 19, 1816; after common-school education, studied law and was admitted to the bar of Pennsylvania in 1837: went to England on Government business, and there became a member of the London legation; in 1842 was appointed inspector of the eastern State penitentiary, located at Philadelphia, and held the position until his death; elected mayor of Philadelphia 1856; member of Congress 1890. He was prominent as one of the board of directors of Girard College and of the board of directors of the city trusts, as a Mason and as a lawyer, but chiefly as an advocate of reform in prison discipline and the general subject of legal punishment. He wrote much on this subject, including *Brief Sketch of the Origin and History of the State Penitentiary for the Eastern District of Pennsylvania* (1872); *Inside out, or Present Prison Systems and their Effects on Society and the Criminal* (1888); *The State and the Prison* (1886). D. in Philadelphia, Mar. 22, 1895.
F. Sturges Allen.

Venable, William Henry, LL. D.: author; b. in Warren co., O., Apr. 29, 1836; taught at the age of seventeen, and attended teachers' institutes at Oxford, O., during vacations, being one of the first teachers upon whom the Ohio board of examiners conferred a life certificate; graduated at the Normal School at Lebanon, O., in 1862; became Professor of Natural Science in the Chickering Classical and Scientific Institute in the same year, and became its principal and proprietor in 1881; was first president of the Cincinnati Society of Political Education, which he organized, and in 1882 founded and conducted in that city the Afternoon School of Popular Science and History; retired from teaching in 1886, devoting himself to literature and lecturing; is actively connected with many educational associations; received the degree of LL. D. from the University of Ohio in 1886. He is an editor of the *Ohio Archæological and Historical Quarterly*; edited *The Dramatic Actor* (1874) and *Dramatic Scenes from the Best Authors* (1874); and has published *June on the Miami, and other Poems* (1871); *A School History of the United States* (1872); *The School Stage*, a collection of original and adapted juvenile plays (1873); *The Teacher's Dream* (1880); *Melodies of the Heart*,

and other Poems (1884); *Footprints of the Pioneers in the Ohio Valley* (1888); and *Historical Sketch of Western Periodical Literature* (1888).

Verrall, Arthur Woolgar, Lit. D.: English lawyer and classicist; b. in Brighton, England, Feb. 5, 1851; was a student at Wellington College 1865–69, and afterward at Trinity College, Cambridge, where he received his degree of bachelor of arts in 1873; was made a fellow of Trinity College in 1874, and a member of the college staff in 1877, in which year he was also called to the bar at Lincoln's Inn. His publications include an edition of Euripides's *Medea* (1881); *Studies in Horace* (1883); an edition with translation of Æschylus's *Seven* (1887): *Agamemnon* (1889); translation of Euripides's *Ion* (1890); *Chœphori* (1893); and Euripides's *The Rationalist* (1895).

Victor Emmanuel III.: king of Italy. He was born Nov. 11, 1869, and succeeded his father, King Humbert I, on July 29, 1900. He married, Oct. 24, 1896, Princess Helène of Montenegro.

Victorium: an elementary substance obtained by Sir William Crookes, of London, England, in fractioning the rare earth yttria. Crookes found in a photograph of a spectrum not visible to the eye a group of lines indicating a new element for which he proposed the name *victorium*, in honor of the Queen. Victoria, the oxide of victorium, differs from yttria in many of its chemical characters. Tested by its position in a series of earths obtained by fractional precipitation with dilute ammonia, victoria is found to be less basic than yttria and more basic than most of the earths of the terbia group. In the purest state in which it has been prepared victoria is of a pale-brown color. The atomic weight of victorium is probably near 117. Marcus Benjamin.

Vieque: an island, belonging to Puerto Rico, and 13 miles east of it; 21 miles long and 6 miles wide. Many cattle and considerable sugar are raised. The chief settlement is Isabel Segunda on the north side, but there are better harbors on the south side of the island which are not exposed to the northerly winds. All supplies are brought from San Juan, the most of them being of American origin. The island is very fertile and adapted to the cultivation of nearly all the fruits and vegetables that grow in the West Indies. C. C. Adams.

Villages and Village Communities: The term *village* as now used, being essentially equivalent to the archaic term *vill* of the old English law, has no definitely fixed meaning; and it had none in the early English law, in which it appears to have been used nearly synonymously with the word *town*, for any community having certain powers and duties of local government.

In general in England every portion of land is considered or assumed to lie within the limits of some village, although there are rare cases where localities endowed with large immunities are to a great extent free from the ordinary rules of police law, and physically are not considered as forming part of any village; and there probably are some tracts, not always small ones, which are deemed to belong to two or three or more villages in common. Even a city or borough may be a village or a group of villages.

Generally speaking, the village of the thirteenth century was the same as what is called a *civil parish* in the nineteenth century. This is due to the fact that in Southern England the parish was coincident with the village, and in the northern part the counties were large and even consisted of a group of villages, and in the modern law the term parish in England has generally supplanted the term village or township, from causes which came into play during the reign of the Tudors, when the rate for the relief of the poor was imposed, a parish being limited to a district over which the poor-rate was established. This imposition of poor-rates, and of other rates imposed by Parliament after the model of the poor-rates, caused the parish to become the important district for most of the purposes of local government and local taxation; but there was little more than a change of name, a modern parish answering very closely to the old village.

The term village is distinguished from hamlet as being usually more inclusive, the hamlet always lying within the boundaries of the village, but the existence of the hamlet was rarely recognized legally except to treat it as a mere geographical tract, a village or township being not only a part of the earth's surface, but also a community. The English village is a legal community, which, although it has no definite rights, was under certain legal obligations, such as the obligation to attend a court of justice held in eyre, the sheriff's turn, the hundred and county courts, the coroner's inquest, and the frankpledging of its members who ought to be placed in frankpledge. It was also bound to produce any of its members accused of crime, to arrest malefactors, and was liable to an amercement if a person were killed within its boundaries in the daytime and his slayer not arrested, its liability in this respect appearing to arise out of immemorial custom as distinguished from the liability of the hundred for the murder fine which arises by express legislation. It was also bound to raise the hue and cry, follow the trail of stolen cattle, and to keep safely prisoners committed to its charge, and other minor duties, including police organization.

The village or township, by either of which names the tract of land occupied by the inhabitants of a village may be designated, thus seems to have many well-defined duties, and would naturally seem to have or to have had some organization, but this organization does not appear upon research, the courts being courts of manors, townships as such having no court or assembly. The constable was the reeve of the lord of the manor, usually elected by his fellows in the lord's court and accepted by the lord's steward, and being compelled to serve because not a freeman.

In much of the modern legislation both in England and in the U. S. the term village is used to designate an assembly of houses in a county, less than a town or city, and the term as so used must be arbitrarily construed according to the evident intent of the statute, and the signification of the word as customarily used within the limits of the enacting government. In New England and New York the towns are the particular communities or territory into which the county is subdivided, answering to the parishes above mentioned in England, but vested with greater powers of local government. In Delaware the terms village and town are indiscriminately applied to collections of houses, the counties being divided into hundreds. The terms are used in Maryland, Virginia, Kentucky, Illinois, New Jersey, Pennsylvania, Ohio, Indiana, Michigan, and the New England States and New York indiscriminately to designate large collections of houses less than a city, and the term village has no exact signification unless it be given to it by the particular statute in which it is used; and in these States an incorporated town and an incorporated village are usually considered as one and the same thing. Thus in the State of New York there is what is known as the village law, which provides that a village having a territory not exceeding one sq. mile or an entire town, and containing a population of not exceeding 300, may be incorporated under this law, which further provides certain rules and regulations fixing the duties and liabilities of the village officers. The same law classifies villages according to their population into three classes, containing respectively 5,000 or more, 3,000 and less than 5,000, 1,000 and less than 3,000, and less than 1,000.

Historical Origin of Villages.—The modern village is probably the survival of what are variously called cultivating communities, agricultural communities, or village communities. These communities were proprietary groups of inhabitants, and the soil of the greatest part of Europe was formerly owned and tilled by them. They had substantially the same character and composition as those which are still to be found in parts of Asia, and the modern land law prevailing in Western Continental Europe before the first French revolution, from which the English real property law is derived, grew immediately out of the customary laws obtaining in these communities, through the feudalism of the Middle Ages. The ancient Teutonic cultivating village or community consisted of a number of families having a proprietary relation to a district divided into three parts, called a mark of the township or village, a common mark or waste, and the arable mark or cultivated area. The community inhabited the village and held the common mark in mixed ownership, and the arable mark in lots appropriated to and cultivated by the several families. Each family in the township was governed by its own free head or paterfamilias, and the precinct of the family dwelling-house was inviolable by all except those constituting his family. The relations of the head of the family to the members of his family were not subject to the control of others, but his relations to the heads of other families were intricate and governed by the usages and customs which had arisen during the formation of the community. His rights and those of his family over the common mark were controlled and modified by the rights of every

other family; and their ownership was strictly an ownership in common. The arable lands appear to have been divided into three great lots or fields, and each householder was given a lot in each of the three fields to be cultivated by him and his family, and was required to pursue the same course of cultivation and raise the same crops as the rest of the community, and was not allowed to interfere with the right of other householders to pasture sheep and oxen in the fallow and on the stubbles of the field under tillage.

The exact method and process by which the customs and laws of these early communities became transferred into and gave rise to the modern villages and land laws of Great Britain are not as yet clearly ascertained. The evidences of the development of one from the other are so clear that the fact is not in doubt, but the complete history of it is yet to be ascertained. The freeholders of the tenemental lands of England correspond in the main to the freeholders and householders composing the old village community, and the rights which exist over the commons in England afford vestiges or relics of the ancient collective cultivation by these communities. There still exists, as a survival of the special supervision of the communal office to watch over the equitable enjoyment of the pastures, the present custom known as *stint of common*, by which the number of beasts which the commoner might turn out upon the waste is limited and regulated. There appear also to be traces of ancient tillage upon some commons which are now entirely waste in England, but which were formerly probably a part of the arable mark which had been removed from one part of the village community to another, the traces of cultivation showing the place of common fields anciently deserted. Other evidences of the existence of the communities are probably found in the fact that in certain sections, as parts of Gloucestershire, a parish formerly, before the establishment of modern and scientific frontiers by commissioners, consisted of a large number of small strips of land lying intermingled with lands of other parishes, this probably being the result of the splitting up of an agricultural community into several communities, each of which was given a share of land; and also in the fact that cases are known where a parish includes a detached portion lying as far away as 10 miles from the main body, and also that in certain parts of Northern England the townships are so intermixed "that there is the most complete jumble which it is possible to conceive."

Among the English institutions which appear to be directly traceable to the early cultivating or village community are the three manorial courts now known as the court leet, the court baron, and the customary court of the manor. Vestiges of the powers exercised by the body of free owners, prior to the time when the conceptions of the legislative and judicial authority became separated, remain in the functions of the leet jury, in the right asserted by the free tenants of sitting as judges in the court baron, and in the election of various petty officers. Similar communities still exist in India, which have been the source of the present land laws of India. See Pollock's *History of the Law of England*; Sir Henry S. Main's *Lectures on the History of Early Institutions*, and also his *Village Communities in the East and West*; Stubbs's *Constitutional History of England*. F. STURGES ALLEN.

Vincent, FRANK, A. M.: traveler and author; b. in Brooklyn, N. Y., Apr. 2, 1848; was educated at Yale, which gave him the honorary degree of A. M. in 1875; spent fifteen years in foreign travel and exploration; has received decorations from the Kings of Burmah, Cambodia, and Siam, and is a member of many scientific societies. In 1884 he presented to the New York Metropolitan Museum of Art his collection of Cambodian and Siamese antiquities and art and industrial objects. He is the author of *The Land of the White Elephant*, in which the ruined temples and palaces of Cambodia and Cochin-China are described for the first time (1874); *Through and Through the Tropics* (1876); *Two Months in Burmah* (1877); *The Wonderful Ruins of Cambodia* (1878); *Norsk, Lapp, and Finn* (1881); *Around and About South America* (1890); *In and Out of Central America* (1891); and *Actual Africa* (1895).

Vincent, JAMES EDMUND, M. A.: English lawyer and journalist; b. in England, Nov. 17, 1857; was educated at Winchester College, and at Christ Church College, Oxford, where he took the degree of master of arts; studied law at the Inner Temple, and was called to the bar in 1884. He has devoted a large part of his time to journalism, and in 1894 became the editor of the *National Observer*; he is now (1899) chancellor of the Bangor diocese. He has made a special study of the land laws and customs of Wales, and from 1887 to 1890 published various works and pamphlets connected with their history, besides which he has written (joint author with M. Shearman) *A History of Football* (1884); *Memoir of H. R. H. the Duke of Clarence and Avondale*; *Welsh Land Question* (1886); and *A Memoir of John Nixon, Esq.* (1897). F. STURGES ALLEN.

Vi'tascope: an instrument for projecting a rapid succession of pictures in such manner as to cause the illusion of motion due to life. In its simpler forms this instrument has long been known. Its present perfection is an outcome of development in several departments of applied science, more especially photography and electricity. The physiological principle on which it depends is that a definite and measurable interval of time is required for the perception of a nerve impression; and however instantaneous this impression may be, time is required for the perception to vanish. The most obvious illustration of this is that a blow upon the human body produces the sensation of pain which may last for hours. About the middle of the nineteenth century Helmholtz measured the velocity of propagation of a nervous impression and found its average value to be less than 100 feet per second. Many hundreds of years ago it was observed that the apparent form of a body is greatly modified if its condition be changed from that of rest to rapid motion. The spokes of a rapidly revolving wheel when seen by continuous light are practically invisible, but if the wheel be revolved at the highest speed in the dark, and momentarily illuminated by a single spark from an electric influence machine or induction coil, every spoke is plainly visible.

Upon this principle an instrument called the STROBOSCOPE (*q. v.*) was invented in 1832. It consisted of a disk through which a series of equidistant narrow radial openings were cut near the circumference. If a moving body, such as a revolving wheel, be viewed through the slits of the stroboscope disk, the eye receives a succession of nearly instantaneous views like those due to the electric spark. Let us assume that the number of spokes of the wheel is the same as the number of slits in the disk, and that the speed of revolution is likewise the same for wheel and disk. Then every time a slit comes in front of the observer's eye a spoke comes into a corresponding position; and it can not be seen except when in this position. The wheel therefore appears at rest even though really in rapid motion. If the rate of revolution of the wheel slightly exceed that of the disk, or if the number of spokes slightly exceed the number of slits, the successive positions of the spokes will advance slightly in relation to those of the slits, and the wheel will appear to have a slow forward motion. By suitably varying the speed of revolution or the number of slits of the stroboscope while the style of construction and rate of motion of the wheel remains unchanged, it becomes thus possible to secure any desired rate of apparent forward or backward motion of the wheel.

In using such an instrument it is obvious that for satisfactory vision much depends upon the illumination of the wheel and the width of the slits. If, for example, the sum of all these widths be only one-tenth of the circumference of the disk, then nine-tenths of the light reflected from the wheel fails to reach the observer's eye, being interrupted by the opaque part of the disk, and indistinctness results from poor illumination. If an attempt to remedy this be made by widening the slits, we no longer obtain approximately instantaneous views of the wheel. In the effect upon the eye sharpness of definition is thus sacrificed to brightness. It is necessary therefore to regard judiciously the duration of the impression produced upon the brain through the medium of the retinal expansion of the optic nerve. Careful measurements by Plateau, Helmholtz, Nichols, and Ferry have shown that the duration of a luminous impression on the retina varies, under ordinary conditions of illumination, from one-tenth to one-fiftieth of a second. It is greatest after a very short exposure to violet light; it is least after exposure to intense yellow light. For ordinary white light the greater the brilliancy of a short exposure the more quickly does its effect upon the retina vanish. For good stroboscopic effects the object viewed must hence be brilliantly illuminated and the interval of time between two successive passages of a slit before the eye must not exceed one-fiftieth of a second. If these two conditions are fulfilled

the visual impression is continuous and the illusion of motion is controllable.

The forms and names which have been given to this instrument are numerous. Instead of employing a disk it is easy to substitute a vertical hollow cylinder, pivoted axially and slitted in a direction parallel to the axis. Upon a strip of paper, whose length is equal to the circumference of the cylinder, pictures are constructed representing successive phases in the periodic motion of a living object. This strip is fixed against the inner wall of the cylinder just beneath the slits, the number of pictures being slightly greater or less than the number of slits if the illusion of horizontal progress is to be produced. The cylinder is made to spin upon its axis while the observer looks at the revolving strip through the slits which pass in front of his eyes. Whether the visual impression is sensibly continuous or perceptibly interrupted depends upon the speed of rotation, but the partial blending of successive impressions produces very strikingly the illusion of individual motion. The names *zoetrope* and *phenakistoscope* have been popularly applied to this form of stroboscope.

Prior to 1880 all pictures intended for the zoetrope were made by hand, and the accurate reproduction of the successive phases of rapid motion was quite impossible. A revolution in this art has been created by the rapid development of instantaneous photography. By the use of sensitive films of gelatin bromide of silver emulsion the time required for the action of ordinary daylight in producing a photograph has been reduced to a very small fraction of a second. Edward Muybridge in California first utilized these films for the photographic analysis of animal motion. A battery of cameras was arranged beside a race-track, each camera being provided with a spring shutter, which was controlled by a thread stretched across the track. A running horse thus broke each thread at the moment when he passed in front of the camera, and twenty or thirty pictures of him were taken in close succession within one or two seconds of time. From the negatives thus secured a series of positives could be readily obtained in proper order on a strip of sensitized paper. Such a strip when examined by means of the zoetrope furnished a reproduction of the horse's motion incomparably superior to anything previously attained.

Muybridge devised an instrument which he called a *zoöpraxiscope* for the optical projection of his zoetrope photographs. The succession of positives was arranged in proper order upon a glass disk about 15 or 18 inches in diameter near its circumference. This disk was mounted conveniently for rapid revolution so that each picture should pass in front of the condenser of an optical lantern. About the same axis was fixed a stroboscope disk of zinc equal in size with the other, but so mounted as to give it rotation in the opposite direction. A projecting lens was placed at its focal distance in front of the glass disk so as to project upon the screen an enlarged image of the moving photograph. The visual effect was very striking, but the difficulties involved in the preparation of the disk pictures and in the manipulation of the zoöpraxiscope prevented this instrument from attracting much popular notice. Artistically it was the forerunner of the instruments known as *kinetograph*, *vitascope*, *cinematograph*, etc.

In 1887, when Thomas A. Edison was busied with the work of improving the phonograph, he conceived the idea of associating with the phonograph an instrument embodying the well-known principle of the stroboscope, so that the reproduction of articulate sounds should be accompanied by the reproduction of the motion naturally associated with them. It was not until 1893 that his conception was successfully realized in the instrument which he named the kinetoscope. Instead of employing a battery of cameras as Muybridge had done to obtain a serial picture of the moving object, Edison devised a special form of camera in which a long strip of sensitized film should be moved rapidly behind a lens, this being provided with a shutter so arranged as to alternately admit and cut off the light from the moving object. The mechanism is so adjusted that forty-six exposures per second are given, the film being stationary during the minute period of exposure, then quickly carried on far enough to bring a new surface of film into the proper position. The interval required for this shifting is about one-tenth of that allowed for exposure, so that the actual time of exposure is almost exactly one-fiftieth of a second. The average speed with which the film moves, including both shiftings and stoppages for exposure, is rather more than one foot per second, so that the whole length of film, about 50 feet, receives between seven and eight hundred successive impressions during its circuit of forty seconds. After this series of negatives has been appropriately developed the strip may be used as a transparency for the purpose of securing a corresponding series of positives. This strip is now ready for use in the kinetoscope. By means of an electric motor the strip of positives is made to move just as it did in the camera, passing under a magnifying lens through which the spectator looks. A revolving perforated disk, actuated by the motor, serves as a shutter, and an incandescent electric lamp appropriately placed thus illuminates each picture at the moment it comes under the eye. The area upon which each picture is formed does not exceed one square inch.

The kinetoscope, like the simple stroboscope, is adapted for only one observer at a time, the eye being close to the magnifying lens and the necessary illumination only moderate. To use the kinetoscope film for projection so as to be visible to a large audience, a source of intense light is found in the electric focusing lamp. At or near the focal point of the projecting lantern condenser the film is made to travel across the field just as in the kinetoscope. A water-cell in front of the condenser absorbs most of the heat and transmits most of the light from the arc lamp, and the small picture thus highly illuminated is protected from injury. A projecting lens of rather short focus throws a large image of each picture on the screen, and the rapid succession of these completes the illusion of lifelike motion.

The projecting apparatus just described has received the name "vitascope," a word of mixed Latin and Greek derivation which is not worthy of commendation. "Projecting kinetoscope" would be a less objectionable name. The "cinématograph," a French instrument by Lumière, differs from it only in matters of detail, but not at all in principle. The same remark applies to the "chronophotographic" projection apparatus of M. Demeny, of Paris, in which strips nearly 2 inches wide and more than 100 feet in length are employed. The combination of kinetoscope and phonograph has received the name of *kinetophone*.

W. Le Conte Stevens.

Vittorino da Feltre: humanist educator; b. in Feltre in 1378 or 1379. His family name was Rambaldoni, but later he was called Da Feltre, from the town of his birth. At an early age he left home to study at the University of Padua, where he was obliged to earn his living as best he could while carrying on his university work. For twenty years we find him located at Padua, gradually rising to the position of one of the most honored professors in the university. He found himself greatly troubled by the looseness of conduct and laxity in living on the part of the students, and from this experience derived his lifelong conviction that the critical period of youth demands, first of all, close, watchful care, and that this can scarcely be secured among the distractions and cares of a university city. About 1422, in consequence of his sorrow at the prevailing disorder among the students at Padua and his inability to check it, he resigned his chair and went again to Venice, where he had previously spent a short period in the study of Greek. Here he founded a private school for the sons of Venetian patricians and others, and rapidly became recognized as the most trustworthy and capable teacher of the new learning in Italy. Here he had just become comfortably settled when he received an invitation from Gianfrancesco Gonzaga, in Mantua, to take charge of the education of his children. Gonzaga was a very good sort of man for those times. He wished to secure the best teacher in Italy for his children, and made Vittorino a very liberal proposition, leaving him free, indeed, to fix his own stipend. Vittorino accepted the post, it is said, in the following terms: "I accept the post on this understanding only—that you (i. e. the Marquis Gonzaga) require of me nothing that shall be in any way unworthy of either of us, and I will continue to serve you so long as your own life shall command respect." The arrangement thus made proved in all ways a fortunate one. A beautiful building, formerly used as a pleasure palace, was given up to the purposes of the school. The children of Gonzaga constituted Vittorino's immediate charge. With them Vittorino was empowered to associate, as fellow-pupils, a certain number of the sons of the leading Mantuan families. He later added a department for promising pupils who were selected without regard to the rank of their families, fees being proportionate

to the means of the patron, or, it would seem, altogether remitted. The pupil who paid nothing was received on absolutely the same footing as the rest of the boys, and in some cases he undertook the entire cost of their maintenance, including clothing and books, for ten years or more. The greatest scholars of the times sent their sons to Mantua. The Mantuan school rapidly became the recognized *ginnasio* for the aristocratic youth of Northern Italy.

The sumptuous palace placed at his disposal for a school was ruthlessly stripped of all its luxurious furnishings, ornaments, and plate in order that the children might lead as simple a life as possible. Certain companions whose influence upon the Gonzaga children he distrusted he weeded out as delicately as possible.

Vittorino definitely held himself the father of his pupils; his school entirely absorbed him. He lived a common life with his pupils at their meals, in the games and excursions, always sharing their interests and pleasures. Such was his control over the boys under his charge that harsh punishments were not needed. He watched carefully over habits of self-indulgence in eating and drinking, and considered regular exercise in all conditions of weather as the foundation of health, and health as the first necessity of mental progress. He aimed at sending forth young men who should "serve God in the Church and the state in whatever positions they might be called upon to occupy." The unique aim of education in general, and that of the child in particular, for him was to correct the body, which was by nature defective and opposed to the soul, and to give to immortal souls that liberty which was taken from them by union with mortal bodies—in short, to obtain, according to the formula *mens sana in corpore sano*, the perfect man. Imitation gives the impulse to all this evolution. The foundation of every pedagogical device is the example of the teacher. Therefore, before instructing others, Vittorino wished himself to be healthy, agile, strong, with good manners, sober, virtuous, learned in many branches of knowledge, an intellectual and a spiritual man.

His first preoccupation was the study of the nature of the pupil and his family history, in order to discover the influences of heredity and of atavism, and to choose the sort of activity upon which it would be better to lay emphasis in his exercise and studies to which each one was called, without excluding the weakest or the most vicious. Instruction, therefore, was of the most varied kind. He offered the pupils many studies at the same time; for, he said, as the body is restored by the variety of its food, so are souls by alternation of materials of study. He believed in the synthesis of knowledge. The school embraced pupils of all ages. He taught reading and writing by means of games and picture-tablets of various colors, thus following the example of Quintilian and, perhaps, anticipating Froebel. Next he offered the children Vergil, Homer, Cicero, and Demosthenes; and when they had been fed upon these as upon pure and unadulterated milk, and their stomachs had acquired in this way strength and vigor, he thought they might safely take up the historians and the other poets—more difficult food to assimilate. Then they were taught rhetoric and dialectic; next arithmetic, geometry, astrology, music. Last of all, he introduced them to the truth of philosophy in the princes of that domain, Plato and Aristotle. No one could leave his school without having attentively gone through all the philosophy taught by those masters.

Vittorino, in his attitude toward his pupils, his fatherly affection for them, his habit of living among them, and in many other facts, suggests Pestalozzi; and, indeed, the latter was himself attracted toward Vittorino, and seems to have known of his work, although Pestalozzi concerned himself, in general, but little with the history of the Renaissance.

During a great part of his existence Vittorino thought he was destined for the monastic life; and yet in his attitude to physical culture he broke entirely with the traditions and practices of the monkish schools of the Middle Ages and of his own time, and set a standard which has perhaps not anywhere been equaled to this day, except in some of the best schools of England and the U. S. He recognized the individuality of each student, his efforts being directed first of all to determining what that individuality was, and so anticipated the movement which is just now gaining ground in the U. S. under the title of child-study in the secondary schools. He was a man of the most eminent scholarship, and yet entered with enthusiasm and complete surrender into the practical and sometimes, it is thought, petty details of school life; for to him no task was so attractive, so noble, so satisfying as that of training the perfect man. All accounts left of him show him to have been a man of singularly sweet and elevated character. Among his pupils were numbered some of the greatest scholars of the period of the Renaissance. Moreover, the children of his noble patron, who grew up under his influence and training, did a surprising thing: with not a single exception, they "turned out well." They represented the best culture and, in most respects, the best living of their time. There seems scarcely a doubt that if the Mantuan school were running to-day it would rank high among modern educational institutions. That it was a great school, and that Vittorino was a great teacher, can not be doubted, and the record of his life and work is an inspiring and interesting study for teachers to-day. See Buisson, *Dictionnaire de Pédagogie*; Woodward, *Vittorino da Feltre and other Humanist Educators.*

C. H. THURBER.

Vizetelly, HENRY RICHARD: publisher, editor, and author; b. in London, England, June 30, 1820; was educated at private schools in Clapham Commons and Chiselhurst; was prominent in founding the *Illustrated London News* in 1842, started the *Pictorial Times*, and became editor of the *Illustrated Times*; in 1852 published the first English edition of *Uncle Tom's Cabin*, and introduced the works of Longfellow and Poe to English readers; vigorously opposed the newspaper-stamp duty, and was first to issue a paper without the stamp, for which he was prosecuted for $60,000, the action against him never being pressed, on account of remedial legislation; was chiefly instrumental in abolishing that duty, as well as the one on paper; was the Paris correspondent of the *Illustrated London News* and of the *Pall Mall Gazette* 1866–76; represented Great Britain in the juries of the Vienna Exposition of 1873 and at Paris in 1878, and for services at Vienna was made chevalier of the Order of Francis Joseph I. of Austria; returned to publishing in 1880, and was first in England to issue the works of Gaboriau, Du Boisgobey, Tolstoi, and Zola, and for publishing the works of Zola was prosecuted by the National Vigilance Association, being warmly and successfully defended by prominent literary men. He started the *Mermaid* Series of *Best Plays of Old Dramatists* in 1887, and is the author of *Story of the Diamond Necklace* (1867); *Berlin Under the New Empire* (1879): *A History of Champagne* (1882); a number of monographs on wines; and *Glances Back through Seventy Years* (1893). D. in Tilford, England, Jan. 1, 1894.

Vogrich, MAXIMILIAN KARL WILHELM: composer; b. in Hermanstadt, Hungary, Jan. 24, 1852; began the study of music at the age of five years and appeared in concerts at seven. From 1886 to 1896 he studied in Leipzig, and then began an extensive concert tour all over the world, which included New York in 1878. In 1881 he went to Australia, but returned to New York in 1886, and has since remained there. His compositions are numerous and important in almost every branch of the art. They include a great number of songs, duets, quartets, church pieces, a mass in A, piano solos, two concertos, pieces for violin and orchestra, an oratorio, *The Captivity*, and an opera, *King Arthur.*

D. E. HERVEY.

Volunteers of America: an evangelical association incorporated in New York city in 1896 by seceders from the Salvation Army. Among its declaration of principles is one providing that "all properties, real estate and personal, of the Volunteer movement shall be held by a body or board composed of five to seven well-known and responsible American citizens," and another that "in the Volunteers property will be held by trustees chosen for the purpose, instead of being deeded over to one man." The constitution of the Volunteers of America is prefaced with the motto: "In righteous principles, unity; in divine doctrines, harmony; in essential methods, liberality." This constitution, which is made up of nineteen articles, primarily declares that "The Volunteers of America is a military movement, military in its methods, organized for the reaching and uplifting of all sections of the people." The third article contains the declaration that "It is, and ever must be, an American institution, recognizing the spirit and practice of the Constitution of the United States; and it is not, and never shall be, controlled or governed by any foreign power whatsoever." It is provided in the fourth article that in all foreign missionary work the principles of home rule,

upon which the Volunteers were organized, shall be maintained, and foreign branches shall have absolutely no connection, so far as their control is concerned, with the national organization in this country. The sixth article provides that "The officer in supreme military command of the Volunteers of America shall be designated as the commander-in-chief, and he shall be elected by the soldiers. He shall have been an officer in the Volunteers for a period of not less than five years previous to his selection, and he shall hold office for a period of ten years and until his successor shall be elected. The commander-in-chief may be removed by a three-fourths vote of the grand field council." Members of the association, in order to be qualified to elect its directors, must be citizens of the United States. Volunteers must subscribe to a belief "in one Supreme God and in the Trinity, in the inspiration of the Bible, in Jesus Christ as the Son of God, in the doctrine of the immortality of the soul, in the resurrection of the body, and in eternal punishment." The sacrament of the Lord's Supper and the rite of baptism are observed by the Volunteers and women are entitled to the same privileges as men in the organization.

Within the first year of the existence of this association it numbered 140 posts, 400 commanding officers, 50 staff officers, 3 regiments, and 10 battalions, its headquarters being in New York city. The Volunteers' prison work is established in many State prisons; they report (1900) having enrolled more than 7,000 prisoners in their Prison League, and are in touch by correspondence and spiritual dealing with about 17,000 men within State prison walls.

Vose, George Leonard: author and civil engineer; b. in Augusta, Me., Apr. 19, 1831; received education in Augusta and Salem, Mass.; studied at the Lawrence Scientific School of Harvard; became assistant engineer on the Kennebec and Portland Railroad, and was engaged on various railroads until 1859, when he became associate editor of the *American Railway Times*; was Professor of Civil Engineering in Bowdoin College 1872–81, and held a similar chair in the Massachusetts Institute of Technology 1881–86. His works include *Handbook of Railroad Construction* (1857); *Orographic Geology, or the Origin and Structure of Mountains* (1866); *Manual for Railroad Engineers and Engineering Students* (1873); *A Graphic Method for Solving Algebraic Problems* (1875); *Elementary Course of Geometric Drawing* (1878); and *Bridge Disasters in America: the Cause and the Remedy* (1887).

Voting Trust: a term used popularly and in a quasi-legal sense to designate the right vested in a single person or a few persons to vote the shares of corporate stock belonging to several or many owners, especially with a view of controlling the business or policy of the corporation or corporations. This is effected either by placing the certificates in the hands of a committee or single person or corporation with irrevocable proxies without registration of the stock, or by placing the stock in the name of a committee or trustee upon the books of the company. It is customary to issue to the beneficiaries of the trust certificates showing their rights as against the stock held by the trustee or committee, and these certificates are bought and sold in the market in the same manner as stock.

Such combinations are not sanctioned by law where their purpose is to tie up or permanently control stocks by the giving of such irrevocable proxies, or by the device of registering them in the hands of trustees; and any person who is a party to such a trust may withdraw his stock from the trustee or committee at his pleasure, whether he be a party to the agreement himself or merely an assignee of the stock of such a party. So also an agreement entered into between a number of parties not to sell their stock except upon the consent of all parties to the agreement is against public policy and void. This restriction has been carried in the State of Maryland to the extent of declaring a by-law of a company which provided that the stockholders desiring to dispose of their stock should give written notice to the company, in order to afford the stockholders or the corporation an option of purchasing the stock at the price named, to be a restriction on the power of alienation amounting to a restraint of trade, and hence to be void. The matter of voting trusts is of very great importance in the formation of combinations between corporations intended to restrain or prohibit competition in the line of business in which the corporations may be engaged; and a frequent method of accomplishing this purpose is the formation of an outside corporation which purchases and owns the stock of the various corporations to be included in the combine and issues its own stock to the shareholders of the combining corporations in partial or entire payment of the purchase price of the stock so transferred to the outside corporation. It has been held that voting trusts are illegal rather because of the unlawful purpose for which they are created than because of their intrinsic illegality. This is especially likely to be the case where, as the result of the trust, the rights and interests of the parties concerned are so complicated as hardly to admit of any equitable change or modification in the manner of holding, and where the purpose of the combination or organization is to carry out the terms of some lawful agreement, such as the reorganization of a railroad company on terms and conditions stipulated for and agreed upon by the parties to the reorganization.

The matter of the legality of voting trusts is so largely dependent upon the specific provisions of the statutes of the particular State in question, and upon the temper or tendency of the court sitting upon the question, that no definite statement of any general rules regulating the subject can be made. The laws of some States expressly provide that a corporation may purchase and own the shares of stock in other corporations whose business is of such a nature as to be materially connected with and assistant to the business of the corporation by which its stock is purchased, and it is upon the general doctrine that a corporation has the right to purchase the shares of stock of other corporations for its own legitimate purposes that most of the modern trusts are based. F. Sturges Allen.

Wagner, Siegfried: only son of Richard Wagner, who, though intended for another profession, has recently taken up music as a career. He was born in Bayreuth while his father was preparing for the production of the *Nibelungenlied* there in 1876. He studied a little music with his father, but devoted most of his time to the study of architecture. But he was possessed with a desire to conduct, and after a few trials he conducted several operas, and later concerts, in Bayreuth, and then studied systematically under Humperdinck. He has already composed considerably, including a symphony which he keeps in MS. His opera *Der Bärenhäuter* was produced in Munich on Jan. 30, 1899, and met with success. D. E. Hervey.

Waite, Mrs. Catharine: lawyer; b. in Dumfries, Ontario, 1829; educated at Oberlin College, and subsequently established the Hyde Park Seminary for young women in Chicago in 1859; studied law at Union College and was admitted to the bar in 1886, and in 1888 was elected president of the Women's International Bar Association. She has published *The Mormon Prophet and his Harem*.

Waite, Henry Randall: editor and clergyman; b. in Copenhagen, N. Y., Dec. 16, 1845; graduated at Hamilton in 1868; was on the staff of the Utica *Herald* 1869–70; graduated at Union Theological Seminary, New York city, in 1873, having edited the *University Quarterly Review*; was pastor of the American church in Rome, Italy, 1871–74; on the staff of the New Haven *Journal* in 1875; edited the *International Review* 1876–77; pastor of the Presbyterian church in Pelham, N. Y., 1876–80; organized the National Reform League in 1876, and was president of the Political Science Association of New York 1876–77; was a special officer of the U. S. census 1880–83; edited the Boston *Citizen* 1885–86, and afterward became editor of *Civics*, in New York city; in 1885 founded the American Institute of Civics, of which he has since been president; was first to apply the term "civics" to those branches of science that relate to the improvement of citizenship. He is the author of *The Motive of St. Paul's Life* (1873), and *Illiteracy and the Mormon Problem* (1885).

Wake Island: a volcanic island in the Pacific, N. of the Marshall group, 19° 25′ N. lat. and 166° 25′ E. lon. Discovered by the Spanish sailor Mendaña in 1568. The island was visited (July 4, 1898) by the second Philippines expedition, which raised the American flag. An order was subsequently issued from Washington to take possession of it. Two peninsulas branch from the main body of the island, one extending N. N. W. and the other N. W. From the head of the island to the end of the longer peninsula the distance is about 6 miles, and to the end of the shorter peninsula about 5 miles. The main body of the island is about 3 miles long and 2 miles wide at its broadest part. The peninsulas are each about a mile wide, narrowing toward the ends, and beyond each end is an unnamed island,

one 2 miles long and the other a little shorter. The group is surrounded by a coral reef. In the water inclosed by the reef and peninsulas there is a depth of 26 feet, which shallows toward the S., and outside the reef there is anchorage in about 200 feet of water. A straight line between the island of Hawaii and Wake island, if projected farther W., passes about 200 miles N. of the Philippines. The uninhabited group will perhaps be available either for a coaling or cable station. C. C. ADAMS.

Wakeman, HENRY OFFLEY: English lawyer and ecclesiastical writer; b. in England, Sept. 15, 1852; was educated at Eton and at Christ Church College, Oxford, where he took the first class in modern history in 1873; read law and was called to the bar, but devoted himself especially to the study of ecclesiastical history. He has held the offices of bursar and tutor of Keble College, member of the council of Keble College, member of the Hebdomadal council of the University of Oxford, and is now (1899) fellow and bursar of All Souls College, Oxford. His publications include *Life of Charles James Fox*; *The Church and the Puritans*; *The Ascendency of France*; and *An Introduction to the History of the Church of England*. F. STURGES ALLEN.

Waldstein, CHARLES, Ph. D., L. H. D., Lit. D.: archæologist; b. in New York city, Mar. 30, 1856; studied at Columbia 1871–73, and at the University of Heidelberg 1873–75, where he received the degree of Ph. D.; studied at Leipzig in 1876, and in the same year went to London, where he studied in the British Museum, delivering a course of art lectures in the museum that year; traveled in Italy and Greece 1878–79; became university lecturer in classic archæology at Cambridge in 1880, and in 1882 was made reader in Greek art in the university; devoted himself to founding a new archæological school, for which purpose a museum of art was created in connection with the Fitzwilliam Museum, of which latter institution he has been a director since 1883; was called to the directorship of the American School of Archæology at Athens in 1888; delivered a course of lectures before the Royal Institute of Great Britain in 1883, and lectured at Columbia College, New York city, in 1886; received the honorary degree of A. M. in 1882 and of L. H. D. in 1887 from Columbia, and A. M. in 1882 and Lit. D. in 1887 from Cambridge. His reputation as an archæologist is largely based on his discovery that the so-called "Apollos" are simply athletes, and on the identification of a head found in the Louvre as the work of Pheidias, and that of a Hermes in Ephesian silverwork on a patera from Bernay in France. He is one of the foreign editors of the *American Journal of Archæology*, and is the author of *The Balance of Emotion and Intellect* (1878) and *Essays on the Art of Pheidias* (1885).

Wales, PHILIP SKINNER: surgeon; b. in Annapolis, Md., Feb. 27, 1837; was educated at the University of Maryland, and after taking a course in the medical department there, removed to Baltimore, finally settling in Washington city; entered the navy as an assistant surgeon in 1856, was commissioned surgeon in 1861, and served in the North Atlantic and Western Gulf squadrons 1862–65; was a member of the board of examiners in 1873–74, commissioned medical inspector in 1873, and appointed surgeon-general of the navy and chief of the bureau of medicine and surgery in 1880, serving until 1884; while chief of the bureau of medicine and surgery subordinates of his defrauded the Government, and he was court-martialed and suspended for five years for neglect of duty, but was acquitted of all actual responsibility for the acts of his dishonest clerks. He is the author of *Mechanical Therapeutics* (1867); *A New Method of Controlling the Velum Palati* (1875); *A New Rectal Dilator and Explorer* (1877); and numerous scientific articles.

Walker, JOHN BAYLDON: English judge and statesman; b. in Royston, Yorkshire, Jan. 16, 1854; received his early education at University College School, London, and then read law in the Inner Temple, and was called to the bar in 1875; entered upon the practice of his profession in the northeastern circuit and the West Riding of York's sessions, and early achieved distinction for his executive ability. He was appointed police magistrate and coroner for Freetown, South Leone, in 1890; acting judge of the Supreme Court of South Leone in 1890; acting queen's advocate in 1892, a member extraordinary of the legislative council of South Leone in 1892, and in 1893 prepared the municipal ordinances for Freetown; in 1894 was a magistrate, and in 1895 judge of the Supreme Court of Turks and Caicos islands; served as agrarian commissioner in 1895 and 1897–98, in which latter year he was appointed chief justice of the island of St. Vincent and fellow of the Royal Colonial Institute, taking up his residence at Kingston, St. Vincent. F. STURGES ALLEN.

Wallace, ROBERT, D. D.: lawyer, politician, and historical writer; b. in St. Andrews, Scotland, June 24, 1831; was educated at Geddes Institution in Culross, the high school in Edinburgh, the University of St. Andrews, and the University of Edinburgh, at the last of which he received the degree of master of arts. He first entered the Church as parish minister of Newton-upon-Ayr; was made minister of Trinity College church, Edinburgh, in 1860, minister of Old Gray Friars, Edinburgh, 1868, and Professor of Church History in the University of Edinburgh in 1872. In 1876 he gave up the clerical profession, and became the editor of the *Scotsman*, which position he resigned in 1880 to take up the study of law. He was called to the bar in 1883, since which time he has devoted himself to legal and political affairs, serving as member of Parliament for Edinburgh East since 1886. He is best known as a contributor of ecclesiastical, periodical, and economical articles to the reviews, including the *Nineteenth Century*, the *Fortnightly Review*, the *Saturday Review*, and others, and is also the author of the article on *Church History* in the *Encyclopædia Britannica*, and the article on *Church Tendencies in Scotland* in Sir Alexander Grant's *Recess Studies*. F. STURGES ALLEN.

Waller, FRANK: artist; b. in New York city, June 12, 1842; studied art in Rome, Italy, 1870–71, and afterward traveled in Egypt; was one of the founders of the Art Students' League, of which he was the first president and for which he wrote *Report on Art Schools* (1879); has recently devoted himself to architecture. His paintings include *Tombs of the Caliphs*; *A Caravan on the Desert*; *The Temple of Kom Ombos*; *Eventide, Venice*; *Testing his Toledo*; and *Hop-Picking*.

Walpole, Sir CHARLES GEORGE, M. A., F. R. G. S.: English lawyer and law-writer; b. in England in 1848; attended Eton School and Trinity College, Cambridge; afterward read law at the Inner Temple, and was called to the bar in 1873; practiced his profession until 1882, when he was made president of the district court of Larnaka, Cyprus; was appointed attorney-general of the Leeward islands in 1889, chief justice of Gibraltar in 1892, and chief justice of the Bahamas in 1893, from which position he retired in 1897; he is now (1899) a justice of the peace at Broadford, Chopham, Surrey, where he now resides; his most important writing is *A Short History of the Kingdom of Ireland*, besides which he is the author of *A Rubric of the Common Law*, *A Translation of the Ottoman Penal Code*, etc. F. STURGES ALLEN.

Walter, WILLIAM H.: organist and church composer; b. in 1825; was the pupil and afterward assistant of Dr. Edward Hodges, and succeeded him, and was the first organist of Trinity Chapel, New York. He received the degree of doctor of music *honoris causa* from Columbia College, with which institution he passed most of his life as organist, lecturer, and instructor. His original compositions are few, and include some hymns, anthems, and a mass; but his services to the Episcopal Church in his tune-books, and especially in editing the compositions of his distinguished master, Dr. Hodges, are of great value. D. in New York, Apr. 20, 1893. D. E. HERVEY.

Walworth, JEANNETTE RITCHIE (*Hadermann*): author; b. in Philadelphia, Pa., Feb. 22, 1837; after living in Natchez, Miss., as a governess in Louisiana, in Arkansas, and in Memphis, Tenn., finally settled in New York city. She is the author of *Forgiven at Last* (1870); *The Silent Witness* (1871); *Dead Men's Shoes* (1872); *Heavy Yokes* (1874); *Nobody's Business* (1878); *The Bar Sinister* (1885); *Without Blemish* (1885); *Alice and Scruples* (1886); *At Bay* (1887); *The New Man at Rossmere* (1887); *Southern Silhouettes* (1887); *True to Herself* (1888); and *That Girl from Texas* (1888).

Waring, GEORGE E.: engineer; b. in Poundridge, N. Y., July 4, 1833; studied civil engineering in Poughkeepsie. In 1857 he was appointed agricultural and drainage engineer of Central Park, New York, resigning his position at the outbreak of the civil war to enlist in the Garibaldi Guards. He became colonel of the Fourth Missouri Cavalry in 1862, kept his command through the war, and was mustered out in 1866. The following year he was appointed manager of

the Ogden farm, Newport, where he remained ten years. In 1878 he planned a drainage system for Memphis, which was afterward adopted in many other Southern cities. In 1882 he became a member of the national board of health, and in 1895 was appointed head of the street-cleaning department of the city of New York. He reorganized the department and made it famous for its efficiency. In 1898 he was made chairman of a commission sent to Cuba to select suitable sites for camps and to suggest plans for the sanitary improvement of the island. On Oct. 29, 1898, four days after his return to New York, he died of yellow fever contracted while in Cuba. A memorial fund of $100,000 was quickly subscribed and devoted to the support of his family and to the endowment of a professorship in Columbia University for instruction in municipal government. Among his published works are *Elements of Agriculture*; *Drainage for Profit and Drainage for Health*; *Handy Book of Husbandry*; *A Farmer's Vacation*; *Whip and Spur*; *Sanitary Drainage of Houses and Farms*; *The Bride of the Rhine*; *Tyrol and the Skirts of the Alps*; *How to Drain a House*; *Sewerage and Land Drainage*; *Sanitary Conditions of City and Country Dwelling-Houses.*

Warneck, Gustav Adolf, D. D.: Protestant German theologian; b. in Naumburg, Mar. 6, 1834; learned a trade, but turned to theology, which he studied at Heidelberg, entered the ministry 1862, and since 1874 has been pastor at Rothenschirmbach, near Eisleben. In 1897 he became Ordinary Honorary Professor of the Science of Missions in the University of Halle. In 1874 he founded *Die Allgemeine Missionszeitschrift.* He is the leading scholar of foreign missions, and no one has done more to give the subject proper treatment. Of general interest among his writings may be mentioned *Missionsstunden* (vol. i., "Die Mission im Lichte der Bibel," Gütersloh, 1878; 4th ed. 1895; vol. ii., "Die Mission in Bildern aus ihrer Geschichte," 1884; 4th ed. 1897); *Die gegenseitigen Beziehungen zwischen der modernen Mission und Kultur* (1879); *Abriss einer Geschichte der protestantischen Missionen von der Reformation bis auf die Gegenwart* (Leipzig, 1882; 4th ed. Berlin, 1898); *Protestantischen Beleuchtungen der römischen Angriffe auf die evangelischen Heidenmission* (Gütersloh, 1885); *Die Mission in der Schule: Ein Handbuch für die Lehrer* (1887; 7th ed. 1896); *Der gegenwärtige Romanismus im Lichte seiner Heidenmission* (Halle, 1889); *Die Stellung der evangelischen Mission zur Sklavenfrage geschichtlich und theoretisch erörtert* (Gütersloh, 1889); *Ultramontane Fechterkünste* (1889); *Evangelische Missionslehre*, in Zimmer's *Handbibliothek der praktischen Theologie* (Gotha, 1892–94, 2 parts; 2d ed. 1897). S. M. J.

Washburn, George, D. D.; Congregational minister; president of Robert College, Constantinople, Turkey; b. in Middleborough, Mass., Mar. 1, 1833; graduated at Amherst College 1855; studied in Andover Theological Seminary 1855–56; and was missionary of the American Board in Turkey 1858–68. In the latter year he became a professor in Robert College, and in 1875 its president, and so remains. He is a commander of the Bulgarian Order of St. Alexander. His contributions to periodicals are numerous. S. M. J.

Washington, Booker Taliaferro, A. M.: educator; b. in Hales Ford, Va., in 1857 or 1858; educated at Hampton Normal and Agricultural Institute, Hampton, Va.; A. M., Harvard University, 1896; principal of the Tuskegee Normal and Industrial Institute since 1881; author of *Black-Belt Diamonds* and of a large number of magazine and newspaper articles. He has rendered valuable services to the colored race during the years 1890–99 by emphasizing, through his work at Tuskegee, the fact that the solution of the Negro problem in the U. S. is not to be attained so much by the Negro's assertion of his political rights as along the lines of intellectual and industrial improvement. His work at Tuskegee and the influence he exerts by reason of his intellectual gifts easily make him the successor of Frederick Douglass in the leadership of the colored race in the U. S.

Water Company: a company formed for the purpose of supplying water for the use of the public, especially water for domestic and manufacturing purposes in general. As private corporations such companies are not different from other private corporations organized for any other business, except in so far as the conduct of their business involves the use or acceptance of public privileges and franchises. By reason of the fact that the proper conduct of the business of such companies and the quality of water supplied by them are closely connected with the public health and the spread of infectious diseases, the exercise of public rights in the distribution and supply of water to families and manufacturing establishments is usually expressly and carefully regulated by statute. The control of the courts over such companies in the supply of water does not extend to the point of compelling them to provide pure or healthful water, but is exerted and accomplished by enjoining the water company from supplying water which shall not be in accordance with the reasonable regulations of the statute as to impurities and healthful qualities. The water companies are also subject to public inspection by the visiting board or other visitatorial officers of the state.

A municipality has no authority, as such, to engage in the business of distributing water to its citizens either gratuitously or for pay; but its authority to do so is derived from express legislative enactment. Neither can a municipal body without such legislative authority enter into a contract with the water company to supply the citizens with water.

The fact that a water company has a contract with a municipality to furnish water for the purpose of extinguishing fires is held not to establish a right of action for damages in the owners of private property which has been destroyed by fire by reason of the failure of the company to supply water according to the terms of its contract with the municipality, there being no privity of contract between the parties to the action.

The rights of water companies in the land or property flooded by their waters are no greater than those of the parties from whom they were received by transfer, unless they were acquired by the corporation by the right of eminent domain. F. Sturges Allen.

Waterman, Marcus: artist; b. in Providence, R. I., Sept. 1, 1834; graduated at Brown University in 1855; painted in New York city 1857–70, and became an associate of the National Academy in 1861; opened a studio in Boston in 1874, where his works were exhibited in 1878; visited Algeria in 1879 and 1883, Spain in 1882, and traveled abroad again in 1884. His pictures include *Gulliver in Liliput*; *The Roc's Egg*; *The Journey to the City of Brass*; and numerous Arabian subjects and American forest scenes.

Waters, Pollution of: in law, a term used to express the dirtying or fouling of waters by a riparian owner or occupant to such an extent as to create a nuisance. Every owner of land through or along which a stream of water flows has the right to have the stream flow in its natural course free from such pollution as will materially affect the character of the stream, and a riparian owner who pollutes a stream so as to interfere with this right creates a right of action for damages.

A riparian owner has a right not only to have the body of water upon which his premises border free from pollution by the act of other riparian owners or occupants, but also to have it free from pollution or fouling by percolation of filth or noxious matter placed upon the soil of owners not immediately adjacent to the stream. It has been held in a few cases that the owners and workers of mines under certain conditions may discharge the refuse from a mine into the stream in such a manner as to alter its character sensibly or materially by fouling it, but the weight of authority holds that the lower riparian owner has a right of action for damages for such a discharge of refuse as creates a sensible alteration of the character of the stream.

Sources of pollution which have been held to create a right of action for damages, and also to afford a basis for an injunction restraining the pollution, are the discharge into the stream of muriatic, sulphuric, and other acids, dyes or dyewares, heated water which injures the character of the stream, blood, refuse, or foul matter from hog-pens, lime-pits, cesspools, etc.

The extent of the right of pollution in the case of the mining law is based upon the theory that the owner of the mine is entitled to the natural drainage of the mine-water, even though it results in the pollution of the stream which subsequently flows over or along the land of another.

Ordinarily a person in whose favor a right of action arises for pollution of water has a right for damages, and also may obtain an injunction prohibiting the further pollution of the water. The matter of pollution of streams has received much legislative attention, both in England and in the U. S., being extensively treated in England in the Rivers Pollution Provision Act of 1876, which is general in its nature, and

in various local acts. In the U. S. there are numerous local acts, which are so diverse in their provisions as to admit of no brief summarizing.

See Haworth *On River Pollution*; the statutes of the various States of the U. S.; and the ordinances of local municipalities. F. STURGES ALLEN.

Watkins, JOHN ELFRETH, C. E., M. S.: civil engineer; b. in Ben Lomond, Va., May 17, 1852; educated at Treemont Seminary, Norristown, Pa., and graduated at Lafayette College in 1871. After a year's service as mining engineer with the Delaware and Hudson Canal Company, he became assistant engineer of construction of the Pennsylvania Railroad at Meadows Shops, N. J., and continued as such until disabled from field work by an accident in 1873, when he was transferred to the Amboy division of that road and assigned to various duties until May 1, 1883. He was then appointed chief clerk of the Camden and Atlantic Railroad, and in 1884 chief clerk of the Amboy division of the Pennsylvania Railroad, remaining in that office until 1886. Meanwhile, in 1884, he became honorary curator of transportation in the U. S. National Museum in Washington, and curator in 1886, which place he held until 1892, when he returned to the service of the Pennsylvania Railroad, and was made special agent in charge of the exhibits at the World's Columbian Exposition in Chicago. On the completion of his work there he became (1894) director of the department of industrial arts in the Field Columbian Museum in Chicago, which place he retained for one year, and then returned to the U. S. National Museum as curator of technology, which office he has since held. He is a member of various scientific, historical, and patriotic societies, and is secretary of the Philosophical Society of Washington. Mr. Watkins has published a number of papers on the history of transportation and similar subjects, among which are *Beginnings of Engineering* (1888); *Development of American Rail and Track* (1889); and *History of the Pennsylvania Railroad, 1846–1896* (1899), a large quarto volume descriptive of the first fifty years of that railroad.

MARCUS BENJAMIN.

Watson, JOHN CRITTENDEN: naval officer; b. in Frankfort, Ky., Aug. 24, 1842; graduated at the Naval Academy in 1860; was attached to the frigate Sabine in 1861, and to the Hartford, flag-ship of the West Gulf squadron, 1862–64, receiving his commission as lieutenant July 16, 1862. He served on the Colorado, flag-ship of the European squadron, 1865–67; was commissioned lieutenant-commander July 25, 1866, and was in command of the Franklin 1867–68. He became executive officer of the Canandaigua in 1868, and the following year was ordered to Philadelphia on special duty. In 1870 he served as executive officer on the Alaska, of the Asiatic squadron, and was commander of the storeship Idaho 1871–73. On Jan. 23, 1874, while serving on ordnance duty in the New York navy-yard, he was commissioned commander. In April of the same year he was ordered to the Mare island navy-yard, where he remained until Feb., 1878, when he took command of the Wyoming, of the European station. In 1880 he became lighthouse inspector for the eleventh district; in 1883 was stationed at the New York navy-yard, and in Aug., 1886, was ordered to the command of the Iroquois, of the South Pacific station. He received his commission as captain Mar. 6, 1887. He was president of the board of inspectors at San Francisco 1888–90, when he took charge of the Mare island navy-yard. In 1892 he took command of the cruiser San Francisco, and was in Rio de Janeiro during the rebellion in Brazil. In May, 1895, he was ordered to Philadelphia as governor of the U. S. Naval Home, where he remained until 1898, receiving his commission as commodore Nov. 7, 1897. At the outbreak of the war with Spain in 1898 he was ordered to the command of a division of the North Atlantic squadron. He was put in command of the Mare island navy-yard Oct. 8, 1898, and in 1899 was made a rear-admiral, and succeeded Admiral Dewey in command of the Pacific squadron.

Watson, ROBERT SPENCE, LL. D.: English solicitor and author; b. June 8, 1837; received his early education at Friends' School at York, and afterward attended University College, London. He has followed the profession of a solicitor, but is chiefly known for his wide and active interest in associations and organizations for the advancement of education and the bettering of the social conditions of the lower classes. From 1874 to 1897 he filled the position of president of Newcastle-upon-Tyne Library Association; was president of the National Liberal Federation and of the Society of Friends of Russian Freedom 1890–99, secretary of the Literary and Philosophical Society of Newcastle 1862–89, of which society he was vice-president in 1893, and vice-chairman of the Royal Grammar School at Newcastle, and member of the council of Durham College of Science of Newcastle, and has held numerous other honorary positions. Among his many writings on educational and social questions some of the best known are *The History of English Rule and Policy in South Africa* (1879); *Irish Land Law Reform* (1881); *The Relations of Labour to Higher Education* (1884); *England's Dealings with Ireland* (1887); *Boards of Conciliation and Arbitration and Sliding Scales* (1888); *Labour: Past, Present, and Future* (1889); *The Recent History of Industrial Progress* (1891).

F. STURGES ALLEN.

Webb, THOMAS E., M. A., LL. D.: Irish judge and philosophical writer; b. in Cornwall, May 8, 1827; educated at Kingswood School, and Trinity College, Dublin, at which latter he received the degree of bachelor of arts in 1850 and of master of arts in 1857; took up the study of the law and was called to the Irish bar in 1861. He was appointed Professor of Moral Philosophy in the University of Dublin in 1857, Regius Professor of Laws in 1867, and public orator in 1879; has served as examiner in law to the University of New Zealand; is now (1899) judge of the county court of Donegal, and chairman of Donegal quarter sessions, which offices he has held since 1887. Besides his miscellaneous writings he is the author of *The Intellectualism of Locke*; *The Veil of Isis*; *A Poetical Translation of Faust*; a series of essays on the Irish land question; *A History of an Idea*, which is an answer to Gladstone on the question of home rule. F. STURGES ALLEN.

Wedderburn, Sir WILLIAM, Bart.: Scotch lawyer and statesman; b. in Edinburgh, Mar. 25, 1838; was educated at Loretto School and Edinburgh University. In the examination in open competition for Indian civil service he took the third place (1859) and served in the Bombay civil service 1860–87, having during that period acted as judge of the high court of Bombay, and as acting chief secretary to the Government of Bombay; was president of the Indian National Congress in 1889; unsuccessfully contested the seat in Parliament for North Ayrshire in 1892, was appointed member of the royal commission on Indian expenditure in 1895, and subsequently chairman of the Indian parliamentary committee; has served as Liberal member of Parliament for Banffshire since 1893. His best-known writings are pamphlets on matters affecting the Indian people, especially those on arbitration courts, agricultural banks, and village communities. F. STURGES ALLEN.

Weiss, JOSEPH: pianist; b. in Kaschau, Hungary, in 1864. He began the study of the piano at seven years of age, and when ten years old was put under Liszt. He also studied composition under Robert Volkmann and Franz Erkel, in the Academy of Pesth, where he took the first prize for composition at the end of his first year. In the ten years following 1881 he played in all the leading cities in Europe. In 1891–93 he was Rubinstein's successor at the St. Petersburg conservatory, and in 1894 settled in Berlin. He visited New York in 1899.

Wentworth, ALONZO BOND: lawyer; b. in Somersworth, N. H., Mar. 28, 1840; entered the University Law School, Boston, graduating in 1862; elected member of the General Court in 1870 and 1874; county judge 1885–91. He edited (1888) *Lindley on Partnership*.

Westcott, EDWARD NOYES: novelist; b. in Syracuse, N. Y., Sept. 24, 1847; d. there March 31, 1898. He was a banker, and his only book, *David Harum: A Story of American Life*, was issued soon after his death. It is a study of life in central New York, and attracted wide attention and reached a very large circulation.

Westlake, JOHN, LL. D.: professor of law; b. in Lostwithiel, Cornwall, England; received his college education at Trinity College, Cambridge, where he received the degree of bachelor of arts in 1850; was a fellow of Trinity College 1851–60. He read law at Lincoln's Inn, and was called to the bar in 1854, and made queen's counsel and bencher of Lincoln's Inn in 1874. He received the degree of LL. D. from Edinburgh University in 1877; was a Liberal member of Parliament from Essex, Romford Division, in 1885; was appointed Professor of International Law in the University of Cambridge in 1888, which position he still (1899) holds. He is best known for his writings on international

law, the most important of which are *A Treatise on Private International Law, or the Conflict of Laws* (1858; 3d ed. 1890); *Chapters on the Principles of International Law* (1894). F. STURGES ALLEN.

Weston, EDWARD: electrician; b. in England, May 9, 1850; early manifested fondness for the physical sciences, especially electricity, but was put to the study of medicine; removed to the U. S. in 1870, determined to follow his own bent; became chemist to the American Nickel-Plating Company, and introduced improvements in the art of nickel-plating; studied dynamo-electric machinery with a view of utilizing it in electro-metallurgy, and in 1873 prepared the first copper-plated carbons; removed to Newark, N. J., in 1875, and engaged in the manufacture of dynamo-electric machinery, establishing what is claimed to be the first factory in the U. S. devoted exclusively to that class of apparatus; was an organizer of the Weston Dynamo-Electric Machine Company in 1877, which was afterward consolidated with the United States Electric Lighting Company, of which he was electrician until 1888; experimented in arc and incandescent lighting in 1875; constructed several incandescent lamps in 1876, afterward steadily developing his systems of electric lighting; later devoted himself to the production of new forms of electrical devices, such as voltmeters, ammeters, and electro-dynamometers, one of his most valuable inventions being that of tamidine, a modification of cellulose, used in incandescent lamps. He was one of the charter members of the American Institute of Electrical Engineers, and its president in 1888.

Whiteaves, JOSEPH FREDERICK: paleontologist; b. in Oxford, England, Dec. 26, 1835; devoted himself from 1858 to 1861 to the study of the surrounding country, and embodied the results of his work in a paper, *On the Land and Fresh Water Mollusca inhabiting the Neighborhood of Oxford.* He went to Canada in 1861, and held the position of scientific curator and recording secretary to the Natural History Society of Montreal. He conducted five deep-sea dredging expeditions to the river and Gulf of St. Lawrence, and joined the Canadian Geological Survey in 1875. He is a fellow both of the Royal Society of Canada and of the Geological Societies of London and America.

White Cross Society: an international association having for its aim the promotion of personal purity, especially among men, and advocating the principle of one law only for men and women. As set forth in its manual, the purposes of the organization are: To urge upon men the obligation of personal purity; to raise the tone of public opinion upon the subject of morality; to secure proper legislation in connection with morality. Persons joining the society promise, "by the help of God," to treat all women with respect, and endeavor to protect them from wrong and degradation; to endeavor to put down all indecent language and coarse jests; to maintain the law of purity as equally binding upon men and women; to endeavor to spread these principles, and try to uplift younger brothers; and to use every possible means to fulfill the command, "Keep thyself pure." The methods of work followed by the society, while various, utilize means already established, and institute no new process, seeking to further its objects "by the full presentation of those spiritual truths which form distinguishing characteristics of Christianity, and demonstrate its unalterable hostility to every form of impurity." The movement was inaugurated in England in 1883 by the Bishop of Durham, and in the same year the work was taken up in America by the Rev. B. F. De Costa, rector of the Church of St. John the Evangelist, New York city, in association with some young men. The society is now established throughout the U. S. and in Canada.

Whiteway, Sir WILLIAM VALLANCE: statesman; b. in Little Hempston, Devonshire, England, Apr. 1, 1828; began to study law in Newfoundland in 1843, was admitted to the bar in 1852, and was made a queen's counsel in 1862. He entered the Legislature in 1858, and was Speaker of the Assembly from 1865 to 1869. He was Solicitor-General from 1873 to 1878, when he became Premier and Attorney-General, holding this position till 1885. In 1889 he re-entered the Legislature as Prime Minister, and was returned in 1893 and 1895. In 1880 he was made a K. C. M. G., and received the honorary degree of D. C. L. from King's College, Windsor, Nova Scotia, in 1890, and from Oxford University in 1897.

Whiting, ARTHUR B.: musician and composer; nephew of George E. Whiting; b. in Cambridge, Mass., June 20, 1861, and received most of his musical education in Boston. His concerto for piano and orchestra in D minor, op. 6, was produced by the Boston Symphony Orchestra in Nov., 1888, and his suite for strings and four horns in G minor, op. 8, by the same orchestra. He ranks among the foremost American musicians. D. E. HERVEY.

Whiting, GEORGE ELBRIDGE: composer; b. in Holliston, Mass., Sept. 14, 1842; began the study of the piano and organ at a very early age, and made his first public appearance at the age of thirteen years. He went to Hartford, Conn., in 1857 as organist, and organized the Beethoven Society there. In 1862 he went to Boston and then to England for a year under W. T. Best, then to Albany, N. Y., next to Berlin for more study, back to Albany, and finally to Boston, where, in 1874, he was appointed organist of the Music Hall. In 1879 he was appointed organist of the Music Hall, Cincinnati, but returned to Boston after three years. Among his compositions are a mass in C minor (1872); mass in F minor (1874); prologue to Longfellow's *Golden Legend* (1873); *Dream Pictures*, cantata (1877); *The Tale of a Viking*, cantata (1880); *The Princess*, concert overture; *Henry of Navarre*, cantata (1885); *Leonora*, cantata (1879); *Midnight*, cantata (1893); several concertos, fantasies, and piano works, much organ music, and a large number of songs. D. E. HERVEY.

Whitsitt, WILLIAM HETH, A. M.: educator; b. in Nashville, Tenn., Nov. 25, 1841; educated at Union University, Murfreesboro, Tenn., 1857–60; A. M. same; at University of Virginia 1866–67; Southern Baptist Theological Seminary 1867–69; University of Leipzig 1869–70; University of Berlin 1870–71; Professor of Church History in Southern Baptist Theological Seminary, Louisville, Ky., 1872–99. He is author of *A Question in Baptist History* (1897), and associate editor of *Johnson's Universal Cyclopædia* in charge of articles relating to the Baptist Church. C. H. THURBER.

Whittredge, WORTHINGTON: artist; b. in Springfield, O., May 22, 1820; early began portrait-painting in Cincinnati; visited Europe in 1849, studying in London, Paris, Düsseldorf, Belgium, and Holland, and lived in Rome 1855–59, when he returned to the U. S. and settled in New York city, becoming a member of the National Academy in 1861, and was president of the Academy in 1874; sketched in the West in 1865, accompanying Gen. John Pope on his tour of inspection. Among his more noted paintings are *The Schützenfest*; *The Roman Campagna*; *The Ruins of Tusculum*; *The Rocky Mountains from the River Platte*; *Twilight on the Hudson*; *The Plains of Colorado*; and *Afternoon in the Woods.*

Wiedemann, *vee'de-maăn*, GUSTAV HEINRICH, Ph. D.: physicist; b. in Berlin, Oct. 2, 1826; educated in his native city, and received the degree of doctor of philosophy from the University of Berlin in 1847. In 1851 he entered as privat docent in that institution, and in the latter year he married the daughter of Prof. Mitscherlich. Mitscherlich was at that time Professor of Physics in Berlin and Wiedemann was one of his pupils. In 1854 Wiedemann was appointed Professor of Physics at the University of Basle; in 1863 he was called to a corresponding position in the faculty of the Polytechnic School at Brunswick; in 1866 he succeeded Eisenlohr in the Polytechnic Institute at Karlsruhe, and in 1871 he became Professor of Physical Chemistry at Leipzig. This chair he held until 1887, at which time Hankel, the Professor of Physics, was retired on account of old age and was succeeded by Wiedemann, who held the position until his death, in Leipzig, Mar. 24, 1899. Wiedemann is best known as the author of a compendious treatise on electricity which was originally published under the title *Die Lehre vom Galvanismus* (Brunswick, 1860). It was subsequently rewritten and enlarged, and reappeared as *Die Lehre von der Elektricität* in four large volumes (1882). A new edition of this well-known work was in process of issue at the time of his death. On the death of Poggendorf in 1877, Wiedemann became the editor of the *Annalen der Physik und Chemie*, and he carried this famous periodical through sixty-seven volumes. He was likewise the author of numerous papers on experimental physics, particularly in the domain of magnetism. His determination of the conductivity of metals, carried on in collaboration with Franz, is among the classical memoirs on that subject. E. L. N.

Wieniawski, *vee-nĕĕ-aav'skĕĕ*, HENRI: violinist; one of the greatest performers of the world; b. in Lublin, Poland,

July 10, 1835, and began the study of the violin when six years old; became a pupil at the Paris conservatory in 1843, and three years later took the first prize. In 1848 he went to St. Petersburg, but returned to Paris in 1849 to study harmony, and again he took first prize. Then he began a concert tour with his brother Joseph, an excellent pianist. In 1860 he was appointed solo violinist to the Emperor of Russia. In 1872 he visited the U. S. with Anton Rubinstein, remaining nearly three years. In 1875 he succeeded Vieuxtemps in the Brussels conservatory, and divided his time between his duties there and playing at concerts. He composed much for the violin, and his works have an immense popularity, being in the repertory of every violinist. D. in Moscow, Apr. 5, 1880. D. E. HERVEY.

Wiley, HARVEY WASHINGTON, M. D., Ph. D., LL. D.: b. in Kent, Jefferson co., Ind., Oct. 18, 1844; graduated at Hanover College in 1867, and in 1868 was invited to the chair of Latin and Greek in Butler University, which he held until 1871, when he was called to teach scientific branches in the Indianapolis high school, meanwhile studying medicine at the Indiana Medical College, where he graduated in 1871. Having determined to devote himself to the pursuit of chemistry, he entered Harvard, and in 1873 received the degree of S. B. at the Lawrence Scientific School. In 1874 he returned to Butler University to take the chair of Chemistry, from which, in a few months, he resigned to accept a similar appointment at Purdue University, which place he then held until 1883. In the meanwhile he had spent the year 1876 in the pursuit of his favorite science at the University of Berlin, and from 1874 to 1877 was Professor of Chemistry in the Indiana Medical College, and also was State chemist of Indiana from 1881 to 1883. Dr. Wiley was in 1883 made head of the division of chemistry in the U. S. Department of Agriculture, which place he has since held. Under his supervision the chemical laboratory in Washington has been greatly improved, the scope of the work enlarged, and the methods systematized, until it is now regarded as one of the foremost laboratories in the country. Dr. Wiley was president of the Washington Chemical Society in 1886. He presided over the Chemical Section of the American Association for the Advancement of Science in the same year, and was also president of the Association of Official Agricultural Chemists in that year. He was also president of the American Chemical Society in 1893 and 1894. His contributions to chemical science number more than a hundred titles, and in addition he is the author of a text-book in three volumes on *Agricultural Chemical Analysis* (Easton, 1886–87). MARCUS BENJAMIN.

Wilkinson, HENRY SPENCER, M. A.: English lawyer, journalist, and dramatic critic; b. in Manchester, England, May 1, 1853; received his early education at Owens College in Manchester, and at Merton College, Oxford, and in his studies devoted himself especially to the study of the English dramatists; was appointed postmaster of Merton, but continued his studies, and received the degree of master of arts at the Universities of Oxford and London, and degree of bachelor of arts at Victoria University; read law, and was called to the bar at Lincoln's Inn in 1880, but turned his attention to journalism and was editorial writer on the staff of the *Manchester Guardian* 1882–92, and on the *Morning Post* from 1895 to the present time (1899); he served for a number of years as an officer in the volunteer army, but resigned in 1888, being then captain in the Twentieth Lancastershire Royal Volunteers, which was then known as the Second Manchester; he is now (1899) dramatic critic of the *Morning Post*. Besides his regular writings for the journals and his dramatic criticisms, he has published *Citizen Soldiers* (1884); *The Brain of an Army* (1890); *Imperial Defense* (co-author with Sir Charles Dilke, 1892); *The Great Alternative: a Plea for a National Policy* (1894); *The Command of the Sea* (1894); *The Brain of the Navy* (1895); and other essays on topics connected with British public policy. F. STURGES ALLEN.

Wilkinson, WILLIAM CLEAVER, D. D.: Baptist minister; b. in Westford, Vt., Oct. 19, 1833; graduated at the University of Rochester, N. Y., 1857, and at the Baptist Theological Seminary in that city 1859. In the latter institution he was from 1872 to 1881 Professor of Homiletics and Pastoral Theology. Since 1891 he has been Professor of Poetry and Criticism in the University of Chicago. Among his non-educational writings may be mentioned *The Dance of Modern Society* (New York, 1868); *A Free Lance in the Field of Life and Letters* (1874); *Poems* (1883); *Edwin Arnold as Poetizer and Paganizer* (1885); *Epic of Saul* (1891); *The Epic of Paul* (1897); *The Baptist Principle in Application to Baptism and the Lord's Supper* (Philadelphia, 1897). S. M. J.

William Jewell College: an educational institution in Liberty, Mo.; founded in 1849; under the control of the Baptists of Missouri, acting through a board of trustees, who conduct the finances, appoint the officers, and prescribe the general management of the institution; named in honor of Dr. William Jewell, a native of Virginia, who for many years was a practicing physician in Columbia, Mo., was the first to propose the establishment of the college, and gave $10,000 to the building fund. In 1849 the total subscription amounted to $59,432. The college has (1900) an endowment of $300,000. A faculty of 28 gives instruction to 350 students. There are ten buildings, and chemical, physical, and biological laboratories. J. P. Greene, D. D., LL. D., is president.

Williams, Sir GEORGE: founder of the Young Men's Christian Association; b. in the parish of Dulverton, Somersetshire, England, Oct. 11, 1821. He began his business career in Bridgewater, where in 1837 he was converted, and at once began to labor for the conversion of his fellow-clerks and with great success. In 1841 he went to London and entered a dry-goods house, and there continued his efforts on behalf of the spiritual welfare of his associates. He started a prayer-meeting in one of the bedrooms of the house in 1843, and his example was followed by those equally zealous in other establishments. On June 6, 1844, twelve of these religious young men met and formed "The Young Men's Christian Association." Mr. Williams, being very young at the time, kept himself in the background, but the movement owns him as its author. In 1863 he became treasurer of the parent association, and in 1885 succeeded Lord Shaftesbury as president. He is now head of the house successor to the one he entered in 1841, and was knighted by the Queen. He is prominent in organized religious work of different kinds, and president of several such organizations. S. M. J.

Wills, Sir ALFRED: English judge; b. Dec. 11, 1828; received his early education at a proprietary school at Edgebaston, and his college education at University College, London, where he received the degree of bachelor of arts in 1849, taking prizes in the mathematical and classical studies; after his graduation he took up the reading of law in the Inner Temple, and was called to the bar in 1851; began the practice of his profession and rapidly became eminent for accurate legal knowledge and executive ability; he was made queen's counsel in 1872; first recorder of Sheffield 1881–84; president of the railway and canal commission 1888–93; and justice of queen's bench in 1884, which position he still holds (1899). He is an enthusiastic Alpine climber, and has published *Wanderings among the High Alps*; *The Eagle's Nest*; *Translation of Rendu's Théorie des Glaciers de la Savoie*. He has also edited Wills's *Treatise on the Law of Circumstantial Evidence*. F. STURGES ALLEN.

Wilmot, ALEXANDER, K. S. G., F. R. G. S.: South African civil service officer and legislator; b. in Edinburgh, Apr. 9, 1836, and received his college education at the Universities of Glasgow and Edinburgh, where he made a study of Roman law and general jurisprudence; he also studied for the civil service examination, which he passed, and subsequently served in a number of offices in Cape Colony until 1886, when he was retired on a pension; he has been a member of the legislative council of Cape Colony since 1889, and leader of the progressive (or Rhodes) party in the legislative council of Cape Colony; has been instrumental in furthering the interests of social and temperance reform through acts of the legislature. He is now (1899) president of the South African Temperance Alliance. His publications are mostly connected with the history of South Africa, and include *The History of the Cape Colony*; *The History of the Zulu War*; *The Story of the Expansion of Southern Africa*; *The History of our Own Times in South Africa*, and other less important books. F. STURGES ALLEN.

Wilson, Sir ROLAND KNYVET, LL. M., Bart.; English lawyer and author; b. in Swaffham, Norfolk, Aug. 27, 1840; educated at Eton, where he was a king's scholar, and at King's College, Cambridge, where he was the Craven University scholar in 1861, and senior classic in 1863; took up the reading of law and was called to the bar in 1867;

acted as recorder for the *Weekly Reporter and Law Journal* 1867–71; was classic and historical lecturer for Mr. Walter Wrenn 1871–78; reader in Indian law to the University of Cambridge 1878–92. His writings include *A Short History of Modern English Law* (in Rivington's Historical Handbooks, 1874); *An Introduction to the Study of Anglo-Mohammedan Law* (1894); *A Digest of Anglo-Mohammedan Law* (1895); besides which he has edited Sir G. C. Lewis's *Use and Abuse of Political Terms* (1877).

F. STURGES ALLEN.

Wine: France is again leading the wine-producing states. Her product in 1898 exceeded that of Italy by more than 20,000,000 gal., being 852,801,000 gal. France, Germany, and Austria-Hungary were the only great wine-producing countries whose yield in 1898 fell below that of 1897. The annual exports from France are valued at about $50,000,000 on an average, and the foreign wine imported for home consumption or to mix with native wines is worth almost as much as the exports. Italy's product in 1898 was 832,137,500 gal. The country exports only about one-fifteenth of its product, the rest being consumed at home, and very little is imported. The export of wine from Spain has increased to an extraordinary extent since 1887. Large quantities of the ordinary wines are bought in France to mix with French wines. The total wine production in 25 countries in 1897 was 2,843,478,930 gal., of which France, Italy, and Spain supplied 2,059,688,200 gal. The total production for 1900–01 is estimated at 3,600,000,000 gal. The U. S. now ranks fifteenth among the wine-producing countries.

Winter, Sir JAMES SPEARMAN, K. C. M. G.: Canadian solicitor and legislator; b. in Lamaline, Placentia Bay, Jan. 1, 1845; was educated at St. John's, and read law and was called to the bar in 1867; was created queen's counsel in 1880. He served as a member of the House of Assembly, Newfoundland, 1874–89, and again in 1893, being Speaker 1877–78, member of the council 1879–89, solicitor-general 1882–85, and attorney-general 1885–89. He was judge of the Supreme Court 1893–96, and in 1897 was made premier. He represented Newfoundland at the fisheries conference in Washington in 1887, was a delegate from the colony to London on the French treaties questions in 1890, and in 1898 a member of the Anglo-American conference at Quebec.

F. STURGES ALLEN.

Witwatersrand (literally, White Water Range): the name given by the Boers of the South African Republic to the height of land S. and S. W. of their capital, Pretoria, which forms the water-parting between the head fountains of the Klip and Vaal rivers on the S. and the Limpopo on the N. The word *rand* is applied by the Boers to any slope down which river drainage flows. The Witwatersrand extends about 100 miles, nearly E. and W. in 26° S. lat., approximately. It has become famous, since 1886, as the greatest gold-producing region in the world. The area over which mining operations had been extended up to 1896 is not more than about 65 sq. miles; but in 1895 it yielded $38,110,000, which was $8,500,000 less than all the gold mines of the U. S. produced in the same year. The rand rises above a bleak plateau that has little value for agriculture. The climate is mild and equable. Before gold was discovered, the herds of the Boers grazed over the district, and it was thought to be fit for nothing but pasturage. Gold-mining did not fairly open until 1887. The rocks forming this district are sandstones, quartzites, shales, and conglomerates that at some time were lifted above the general level to form the rand, which consists of the upturned edges of these rocks tilted at an angle of 25 to 45 degrees from the horizon. It is in the conglomerates, locally known as "banket reefs" from their resemblance to almond rock-candy, that most of the gold is found. The conglomerate dips rapidly beneath the surface and has been found by the diamond drill at a depth of 2,500 feet. The first mines were established along the outcrop only, but shafts have since been driven that strike the conglomerate beds about 2,000 feet below the surface. The structure of the country and the evidence of the diamond drills have satisfied the experts that the reefs continue for a long distance at depth, and mining engineers are confident that they can mine to a depth of 5,000 feet. A peculiarity of the ore is that it is remarkably uniform in the quantity of the gold it contains. Various experts have made estimates of the total amount of precious metal that may be obtained from the district lying within 20 miles of Johannesburg. The most conservative estimates agree that the conglomerate will yield about $3,500,000,000 down to the 5,000-foot level, or about ten times the value thus far of the total gold and silver product of the famous Comstock lode.

These marvelous deposits were not discovered until long after mining had been profitably carried on in four other districts. In 1889 the output was 369,557 oz., while in 1895 it was 2,277,635 oz., or over ten times as much as the four other districts put together. Above or near the gold-bearing conglomerates are extensive beds of coal, which have been only slightly developed, though the fuel required by the gold-mining industry is derived from them. Iron ores also abound. Many black workmen, as well as whites, are employed in the mines and reduction-works, the average weekly pay of the whites being $26.25. The ore can be obtained and reduced only by the use of expensive machinery, and the Witwatersrand does not hold out the inducements to poor men that they once found in the placer diggings of California and Australia. This fact has been ignored by miners who have flocked to the district from all parts of the world, and there has been suffering in consequence, the supply of white labor exceeding the demand.

The development of the mines gave rise to JOHANNESBURG (*q. v.*), the most wonderful town of South Africa, situated close to the southern slope of the Witwatersrand and near its eastern end. In Sept., 1886, its site was nothing but a bleak plateau, 5,600 feet above sea-level. At that time the price of a few oxen would have purchased the entire site. The latest census (July, 1896) showed that 51,225 whites and 51,849 colored persons were then living within 3 miles of Market Square. Much of the city is most substantially built. In less than ten years many costly buildings, including churches, banks, theaters, clubs, and a stock exchange, were erected on this part of the desert *veldt*. The city is connected by rail with Cape Town, which is nearly 1,000 miles distant, with Pretoria and Delagoa Bay on the Indian Ocean on the E., and with Natal on the S., and is thus becoming a very important railroad center. The city has been greatly hampered by the unprogressive policy of its Boer rulers. The foreigners who built the city had developed the mines and filled the treasury of the republic with funds derived from the heavy taxes levied upon them; yet they were not admitted to citizenship, and had no voice in public affairs. Though the city has more than 100,000 inhabitants, it has no adequate system of lighting, no sewerage system, and no general water-supply. It has had a board of health, but no municipal government, and no public schools except those conducted in the Dutch language. Its affairs have been controlled from Pretoria, the capital. This state of things led to the formation at Johannesburg of a National Union for the purpose of securing legislative and administrative reform. Petitions were presented, but failing to secure redress, and it being rumored that the Boers were about to attack the town, the central committee of the National Union constituted themselves into a provisional government pledged to reform; men were enlisted, an appeal for intervention was sent to the imperial commissioner, and a letter was sent to Dr. Jameson, administrator of the British South African Company in Matabeleland and Mashonaland on the N., asking his aid in the event of disturbances arising. He at once set out (Dec. 28, 1895) with several hundred men, before the National Union at Johannesburg was really in need of his assistance, and was defeated and captured by the Boers Jan. 1, 1896. The whole scheme (whatever its real nature was) collapsed, and nearly all its leaders were tried and punished by imprisonment or fine, or both. The Uitlanders still pressed for the rights of good government, however, and the Boers, impressed at last with the need of reforms as a means of maintaining the public peace, initiated several reforms (July–October, 1896), including provision for the education in their own tongue of the children of the Uitlanders. For Transvaal war of 1899–1900, see AFRICA.

C. C. ADAMS.

Woman: the human female. The distinctive characteristics of woman have received considerable attention from anthropologists and psychologists, and a body of information of this kind is grouped under the phrase "secondary sexual characters" in its application to man and woman alike. The peculiarities of both man and woman are called secondary to draw a distinction from the primary, which refers to the final difference of sex itself. Any other general and constant difference characterizing one sex as compared with the other is thus a secondary sexual character.

There are several points of view from which woman may be viewed in the search for such characters—i. e. the points of view of the ethnologist, who inquires into the place and function of woman in the development of the race, and in all the institutions of human life from earliest times and under all conditions of culture, and modes of life; that of the physical anthropologist, who inquires into the physical points of distinction between man and woman, such as the characteristics of the skull, the growth and maturity of the body, etc.; and, finally, the point of view of the psychologist, who seeks to define the mental peculiarities, tendencies, abilities, failings, etc., of woman. Space does not permit more than the barest outline of the results acquired in two of these departments—those of anthropology and of psychology, giving us a concise idea of the traits which differentiate woman in mind and body.

Woman's Physical Traits.—From the point of view of the development which recognizes a progress of the physical organism from infancy to old age, recent researches show that woman has a group of physical features which are nearest akin to the relative proportions of infancy. That is, the development of woman from infancy to maturity does not involve as great change in amount or kind as that of man. Woman reaches her maturity by a more direct path than man and with less physiological disturbance. This is shown in several facts which are interesting for themselves, whether this generalization from them be destined to stand as a final one or not. The skull shows less change from the infant type both in the variety it attains, compared with man, and in the actual growth in size. This is true also of the extremities, as is popularly known. The small, almost infantile hands and feet of women is a matter of popular remark in some instances both of individuals, of certain races, and of the average woman of other races. And the customs of some communities, as the binding of the feet of Chinese women, show that this fact has worked its way into national customs. Certain of the proportions of the body, viewed as a whole, are equally striking: the abdomen remains relatively large, bearing a close analogy to the protruding abdomen of infants both male and female. In man this group of organs diminishes relatively in size, growing flat. Another very prominent physical character of woman is the breadth of hip and large relative development of the thighs generally. This latter feature, although supporting the fact of relatively less development than in man, has also an important meaning in connection with the function of maternity, referred to later on. In height, woman is shorter than man; in girth of chest and waist, smaller; the single physical measurement in which she shows greater development than man, relative to her own measurements generally, is that of the hips referred to.

Another generalization reached by scientists in this connection refers to the grouping which the female proportions show as fitting the woman especially for the functions of maternity. The general contour of the body is thought to be suggestive to the male. The lines are sweeping in their curves, the outline is full and graceful, and there is a striking lack of those special developments of muscle so prominent in man, and which find their *raison d'être* in the active pursuits, contests of strength, and competitions which men are normally exposed to. The muscular development of woman is very much behind that of man, and in its place, actually covering many of the muscular enlargements most conspicuous in man, there is a development of fatty tissue which directly interferes with the most effective use of even the degree of muscular capacity which she really possesses. Further, the great development of the pelvis takes form in peculiarities of shape pointing directly to the accommodation of the infant during its intra-uterine life. The problem of the female pelvis evidently arises from the upright position of man as compared with the quadrupeds. The line of downward pressure makes necessary some modification of structure. The actual differences of the female from the male pelvis are in large measure due to the fact that the female pelvis has to support the young child many months before its birth. Further variations due to the same cause are a setting in of the femur from its point of articulation with the pelvis downward, so that the legs tend together toward the knees, giving a somewhat knock-kneed appearance. This is exaggerated by the smaller relative development of the muscles of the lower leg. The legs as a whole, therefore, present an appearance of instabilty, which suggests lack of adequate support to the body. This peculiarity is of importance practically, since it tends to incapacitate the woman for violent exertion upon the feet, for running, etc. There is an analogous lack of straightness in the arms, an angle being made at the elbow, outside, by the upper and lower arms—a peculiarity which, in this latter case, man shares, but in a much lesser degree. Moreover, there is a peculiarity in the arrangement at the upper arm and "collar-bone" in the woman which prevents her making some combinations of arm movements possible to man; this is seen in the girl's attempts at throwing a stone in the peculiar way that boys do it. It is claimed also by some investigators that there is a greater spreading of the great toe and its first neighbor in woman than in man—another infantile character. This, however, is not surely proved.

Another feature of the physical life of woman should be referred to because of its very great importance in all discussions of the relative place of man and woman in the active occupations of life. The fact is that woman in civilized countries is practically incapacitated—with many exceptions—from two to seven days in every month, to the extent that she can not prosecute any vocation which requires continuous standing, lifting of heavy burdens, or any sudden violent exertion whatever. This character extends through the whole child-bearing period.

One other secondary character in woman should not be omitted from any enumeration even of the most prominent only—i. e. the voice. The female voice gets its distinction from the male voice from anatomical differences. The larynx is smaller and differently shaped. The vocal cords are consequently shorter. What the differences are in the quality and pitch of voice need not be detailed, since they are a matter of common observation.

In the matter of relative rapidity of growth of boys and girls an interesting fact has been discovered. Boys grow faster and are larger up to a certain period (about the eleventh year), when girls overtake them both in rate of growth and in actual height and weight. This continues, though in a lessened degree, for three or four years, after which the boys go ahead again. The girls attain their maximum earlier than the boys (girls at twenty and boys at twenty-three, differing somewhat in different countries).

Woman's Mental Traits.—When we come to the mind we find that psychology is behind anthropology. Very little direct evidence as to mental differences which can be surely set down as due to difference of sex has been accumulated. This is due in part to the condition of girls' education. Boys and girls have not been brought into even competition, the opportunities open to girls have not been equal nor adequate, and the lack of material in school and college has prevented the application to girls of the tests applied in late years to boys. Single cases of success or failure on the part of woman are of no great value—no more so than the occurrence in particular women of peculiar features, peculiar strength, weakness, or what not. Very large aggregates are necessary, and the results of researches so far made should be received with this caution.

The most reliable indications of the intellectual character of woman, as far as her character has anything peculiar about it, are to be found in analogies drawn from her physical structure, and from the current usages and conventions of society—separately, or better, when these two kinds of indication agree. Both of these facts—i. e. the woman's body and her social position—are due to a long series of adaptations, and in discussing such a question the outcome must be taken to define and to limit woman, whatever our desire may cherish in the matter.

Making a conservative statement of results on these lines, and discarding all theoretical considerations, a very few things remain to be said. Woman is more "affectible" than man, as the fact of being more easily stirred to emotion is called by the writers in this field. The root of this difference seems to lie in the nervous irritability connected with the function of maternity. At least it is evident to the most casual observer that the father does not take the fact of paternity in the emotional way that the woman shows on the maternal side. This distinction between the man and the woman is one of the child's earliest and safest distinctions—that between the father's and the mother's treatment of him. The mother's fund of tenderness is needed. It is not an accident. And this exhibition of the distinction may be taken as an instance of the characters of mercy, pity, and sympathy which tinge her whole life with glory. From this distinction, however, others spring which to the psychologist are necessary results, but results which

the woman is accustomed to consider much less "glorious." This greater affectibility makes woman less calm in emergencies, less judicial in weighing evidence, less capable in argument—since argument can very rarely be stripped of its power to excite emotion—more impulsive, more capricious, stronger and more tenacious in the life of affection, but more unreasonable and violent in the repudiation of the affections. And a host of minor traits follow—traits so clearly recognized in current opinion and so ingrained in the conventions of society that their very presence requires such an explanation. Where a man argues, a woman is impelled to positive assertion; where man is direct and blunt, woman is evasive and insinuating—a fact often accounted for by the difference in physical strength, the woman having to defend herself by some form of deceit where a man can strike a blow; where man is impatient, woman is compassionate and long-suffering; where man finds amusement in brutal sports, a woman shudders at them; where man seeks variety and needs change to stimulate his interest, a woman is content in the greater normal interest born of her more intense feeling; where man is restless under conflicting opinions, woman is calm in the enjoyment of the insight that takes the place of reasoned conviction.

Some few distinctions in the activity of the senses have been discovered. Women are more free from the normal defects of vision known as "color-blindness"; they oftener have "memory-forms" or natural visual schemes of arrangement of numbers, etc. The wider distinction that women are more insensible generally, and especially to pain, claimed by Lombroso, is not proved. It is held by Galton and others that the popular opinion that woman is more sensitive generally is erroneous, and arises from confusion between keenness of sense-discrimination, in which men are superior, and nervous irritability or affectibility, which is greater in woman.

All these particulars, however, are merely incidents in the general fact of temperament, and must have their cause deep down in the life-history of the race. And the rise of some of them does not seem to date back beyond our ability to trace them. Anthropologists tell us that the rude woman of more primitive times was not troubled with the inconveniencies incident to maternity that the modern civilized woman is. Primitively, the woman did the hard manual and day labor of the family and tribe, the man being off on the chase, or, when at home, enjoying the fruits of the woman's toil. The peasant life of some of the Continental countries even now—notably Germany—shows a similar state of things. The women do much of the outdoor agricultural work, and they are not incapacitated periodically, nor does the lying-in nor the subsequent nursing period keep them long from the regular round of daily toil. In the trend of development, therefore, a premium seems to have been put upon the exaggeration of the characters of woman which come into conflict with the demands of active life. Inasmuch as this is a matter of development, it can not be remedied by artificial devices, and any great change in the condition of woman in this respect must come by the same gradual process. Of course, the recognition of the fact is the first essential, and the intelligent regulation of the life of woman in a way to reinstate some of the conditions of her earlier and more hardy outdoor life is the way to do something toward her betterment. Possibly lawn-tennis and the bicycle will do more to "emancipate" woman than the outcry for "woman's rights."

Woman's Moral Traits.—The bearing of all this upon the moral character of woman is again a matter of general observation rather than of exact scientific statement. Yet so far as there are moral attributes which the woman has pre-eminently, in popular estimation, they are again aspects of the general fact of "affectibility" in the opinion of many inquirers. The development of the ethical and religious sentiments is a matter of emotion, as far as psychological classification is concerned, and it is only to be expected that delicate sensitiveness to appeals of an emotional kind in general, such as those of sympathy, pity, indignation, etc., would extend to the higher reaches of sentiment embodied in ethical conduct and religious devotion. The fact is notorious that woman is more religious than man, but that her religion is on a different plane. She yields more readily to authority, is more tenacious of accepted doctrines, is more zealous in missionary endeavor, more often narrow and uncharitable in her religious judgments. The strongest upholders of denominational distinctions are in general women. The bequests and charitable benefactions of women are more likely to take religious and sectarian channels. More than this, religious skeptics among women are comparatively rare—a fact which is a further point of evidence for the view that woman is less open to the pros and cons of debatable questions, and that this is due to the inability to shake off the moving force of educational, hereditary, and conventional beliefs.

The claims of right and wrong are equally strong to woman. Her ethical insight is direct, unswerving, and correct, yet more correct when led by concrete appeals to sentiment than when terminating upon broader social and legislative alternatives. Ethical casuistry is unknown to most women. And the limitation of this sort forbids her, in many instances, from taking the broad and judicial survey which social and legal ethics demands. It is often said that woman's sense of justice is relatively undeveloped, and as far as this is true it is for the reason that the sense of justice is a very complex thing. It is itself an outcome of justice—relative hospitality to all considerations whether sympathetic or otherwise—and just so far as a woman is moved to action by the partial statement of a case, yielding to sympathy too readily, just so far justice is not maintained. The attitudes of children again toward their fathers and mothers is, when looked at fairly, a convincing proof of this. It is equally true, on the other hand, that the habit of man of dealing with questions which require the denial of the impulse to sympathy leads to the atrophy of his altruistic nature and a certain obtuseness of sentiment in ethical and religious matters.

The new science of criminology has investigated the crimes of woman, finding that she tends to commit the crimes which are incident to domestic and personal life rather than those of dishonesty, deliberate scheming, or malice as such. Her suicides are only one-quarter of man's. Apart from those women with whom sexual crime is a profession, lapses from personal virtue are comparatively rare. A large percentage of woman's crimes are those of the accomplice rather than the principal offender.

Social Considerations.—A few conclusions of a social nature seem to follow from what is known to the anthropologist and psychologist concerning the secondary characters of woman. In the first place, it is evident that woman can not compete with man on equal terms in any occupation which requires regular daily physical toil of an exhausting kind. She is liable to lose a few days in every month. As Ellis puts it, her daily capacity can not be represented by a line on a level, but by a series of curves. She is better one day than another, and the point of greatest depression each month denotes incapacity as compared with man. The rise of the curve is gradual also; she only slowly regains her full power. Now it goes without saying that an employer will not engage the weaker laborer at the same wage that he gives the stronger. No doubt women make up for this somewhat by greater conscientiousness in their work, but that again leads to more breakdowns in health and loss of time. The professions would seem to be open to women, but even there the difference will be about that between a man in good regular health and one who has some trouble which very often reduces his vitality and upsets his nerves. Further, women must be wives and mothers, even if they are lawyers and doctors, and the conflicts arising from this duality are inevitable. The kind of employment open to single women, therefore, on equal terms with men is narrowed down to positions not requiring great physical activity, and the type of work from which women are probably destined to drive men altogether is that of the telegraph operator, typewriter, etc., and on higher levels the duties of the cashier, responsible administrator, teacher, and the like, in which her peculiar disqualifications do not hinder her and in which her moral character and conscientious regularity of life give her the distinct advantage. As to literature, art, and other such spheres, the facts are now against her; she has done relatively little. The exhibition of her work in these lines made at the Chicago Exposition was mainly an exhibition of this historical paucity. But she has not had an equal chance. The question is, Will her "secondary sexual characters" ever permit her either to get or to improve "an equal chance"? It should be added in the interest of this result that the indiscriminate claims made by the representative of "the new woman" in many instances only hinder the proper understanding of the facts involved. It would appear also that nothing found out by science stands in the way of the fullest exercise of the suffrage by woman. That question must be argued on other grounds. The evi-

dence we now have of the reforms which women are capable of working in municipal, educational, and other public kinds of administration, in which the corruption of male officials has become a source of national disgrace and danger, is sufficient to show the kind of influence woman might be expected to exert in public life generally.

LITERATURE.—Havelock Ellis, *Man and Woman* (London and New York, 1894); Lombroso, *The Female Offender* (New York, 1895); Morrison, *Crime and its Causes* (London, 1891). Detailed references are given in these works.

J. MARK BALDWIN.

Wood, LEONARD: soldier; b. in Winchester co., N. H., in 1860; graduated at the Harvard Medical School in 1884, and in 1885 entered the army as contract surgeon. In 1886 he was connected with the Eighth U. S. Infantry, and with a detachment followed and captured the Apache chief Geronimo and his band. In 1888 he captured the Apache "Kid," and remained in Arizona until 1890, when he went to the Sierra Nevada camp in California. There he remained four months; was at Fort McPherson, Atlanta, for two years, and then went to Washington as a member of Gen. Miles's staff. He was commissioned assistant surgeon with the rank of captain Jan. 5, 1891. At the outbreak of the war with Spain in 1898 he became colonel of a volunteer regiment of cavalry known as the Rough Riders. He was promoted brigadier-general July 8, 1898, and was soon afterward made military governor of Santiago. On Dec. 13, 1899, he succeeded Gen. Brooke as the Governor-General of Cuba.

Worcester, DEAN CONANT, A. B.: educator; b. in Thetford, Vt., Oct. 1, 1866; prepared for college at Thetford Academy and Newton, Mass., high school; studied at the University of Michigan 1884–87; spent eleven months, 1887–89, traveling and collecting in the Philippines, visiting fifteen islands of the archipelago; returned to the University of Michigan, where he graduated A. B. 1889; assistant in the botanical laboratory of the University of Michigan 1889; instructor in botany same 1889–90; instructor in animal morphology same 1893–96; Assistant Professor of Zoölogy same since 1896. In July, 1890, a second and more extended trip to the Philippines was undertaken by Prof. Worcester and Dr. F. S. Bourns, under the name of "the Menage scientific expedition," the expenses of the expedition being met by Mr. Louis F. Menage, of Minneapolis, Minn. Aided by a royal order from Spain to the governor-general of the Philippines, Prof. Worcester and Dr. Bourns spent two years and a half in the exploration of all the important islands of the archipelago, making valuable zoölogical and ethnological collections for the Minnesota Academy of Science and the University of Minnesota. In Jan., 1899, he was appointed by President McKinley commissioner of the U. S. to the Philippine islands. He has published *Preliminary Notes on Birds and Mammals collected by the Menage Scientific Expedition to the Philippine Islands* (1894); *Contributions to Philippine Ornithology* (1898); *The Philippine Islands and their People* (1898); and several magazine articles on the Philippines.

C. H. THURBER.

Wordsworth, JOHN, D. D., LL. D.: Church of England bishop; b. at Harrow-on-the-Hill, Middlesex, England, Sept. 21, 1843; graduated B. A. at Oxford 1865; was assistant master at Wellington College 1866–67; fellow and tutor at Brasenose College, Oxford, 1867–83; Oriel Professor of the Interpretation of Holy Scripture, Oxford, 1883–85; since 1885 has been Bishop of Salisbury. He has published *Lectures Introductory to a Study of the Latin Language and Literature* (Oxford, 1870); *Fragments and Specimens of Early Latin* (1874); in the Bampton lectures for 1881, *The One Religion: Truth, Holiness, and Peace Desired by the Nations and Revealed by Jesus Christ* (1881: 2d ed. 1887); has edited *Old Latin Biblical Texts* (with Dr. Sanday and Rev. H. J. White, 1883 and 1886); and chiefly the Vulgate New Testament, *Novum Testamentum Latini ad Codicum MSS. fidem* (with Rev. H. J. White, 1889–93). S. M. J.

Wright, CHARLES HENRY HAMILTON, Ph. D., D. D.: Church of England clergyman; b. in Dublin, Mar. 11, 1836; graduated B. A. at Trinity College, Dublin, 1857; Ph. D., Leipzig, 1875; has held various clerical positions at home and abroad; since 1891 has been perpetual curate of St. John's, Liverpool. He has been a voluminous author, especially in the department of Hebrew exegesis—e. g. *Zechariah and his Prophecies Considered in Relation to Modern Criticism*, Bampton lectures for 1878 (London, 1st and 2d ed. 1879); *The Book of Koheleth, Commonly called Ecclesiastes, Considered in Relation to Modern Criticism and to the Doctrines of Modern Pessimism*, Donnellan lectures for 1880 and 1881 (1883); *Biblical Essays* (Edinburgh, 1885); *Introduction to the Old Testament* (1890; 4th ed. 1898); *Primer of Roman Catholicism, or the Doctrines of the Church of Rome Examined in the Light of Scripture* (1896); *Service of the Mass in Greek and Roman Churches* (1898). S. M. J.

Wroblewski, *vrō-blev'ski*, ZYGMUNT (Sigismond) FLORENTY, Ph. D.: physicist; b. in Grodno, Russia, Oct. 28, 1845. While a student at the University of Moscow, he took part in a Polish insurrection (1863), in consequence of which he was sent to Siberia for six years. On his return from exile he went to Berlin and entered the physical laboratory as a pupil of Helmholtz. He subsequently studied under Kohlrausch in Strassburg, in Munich, where he received the degree of Ph. D. (1874), and in Paris. In 1882 he became Professor of Physics at Cracow, which position he held until his death by accident, Apr. 16, 1888. While working in his laboratory at night he fell asleep, overturned a kerosene lamp, and was fatally burned. Wroblewski is chiefly known for his remarkable experiments upon the liquefaction of oxygen, nitrogen, and hydrogen. He was, indeed, the first whose success in producing the last-named gas in the liquid form is unquestioned. His researches upon this subject, made in collaboration with his pupil Olszewski, who has carried them on since his death, are among the most important contributions to this portion of science. See LIQUEFACTION OF GASES, LIQUID AIR. E. L. N.

Wyman, WALTER, M. D., LL. D.: surgeon; b. in St. Louis, Mo., Aug. 17, 1848; graduated at Amherst in 1870 and at the St. Louis Medical College in 1873. For two years he served as assistant physician in the city hospitals of St. Louis, and then engaged in private practice. In 1876 he entered the U. S. Marine Hospital service as assistant surgeon, and had charge of the hospital service successively in St. Louis, Cincinnati, Baltimore, and New York, after which, in 1888, he was sent to Washington as medical purveyor and chief of the quarantine division, and still later was given charge of the national quarantine service and of the publication of the sanitary reports. During 1890 he made an inspection of the quarantine stations on the Atlantic and Gulf coast, from the Delaware breakwater to New Orleans, and on June 1, 1891, became supervising surgeon-general of the marine hospital service. During his administration the scope of the service under his charge has been greatly enlarged, and within a year he has had the quarantine systems of Hawaii, of Cuba, and of Puerto Rico placed under his supervision. The service also has control of the medical inspection of all emigrants arriving in the U. S., and renders aid to the revenue service, the lighthouse service, and the life-saving service. There is also maintained under its direction one of the best-equipped laboratories in the world, where scientific investigations of diseases are being constantly conducted. Dr. Wyman has always been an earnest advocate of sanitary reform in Cuba, and believes that by proper sanitary methods the yellow fever, the chief contagious disease of Cuba, can be suppressed before it reaches the U. S., and he has advocated a treaty with the various republics in the western hemisphere in which yellow fever finds its home, so that the sanitation of the harbors or ports which easily nourish that disease may be enforced, until the yellow fever is totally eradicated from the western hemisphere. In addition to ordinary epidemic diseases, Dr. Wyman has taken a particular interest in tuberculosis and leprosy, and has secured a large tract of Government land in New Mexico where a large sanitarium is to be built, to which are to be transferred all consumptive patients in the marine hospitals. He has secured the passage of a law by Congress authorizing the investigation of leprosy, and now (1899) has that subject under his supervision. The pollution of the source of water-supplies is another important subject which is being investigated under his direction. He is a member of the American Medical and Public Health Associations, and is actively connected with many similar organizations, both in the U. S. and abroad. His many publications, in addition to his public reports, include valuable papers that have appeared in the leading reviews.

MARCUS BENJAMIN.

Wyoming, University of: an institution of learning in Laramie, a town of about 6,000 inhabitants, in the midst of the Laramie Plains, at an altitude of 7,200 feet, and surrounded by beautiful mountains. The university was

founded by the Territorial Legislature in 1886, and was recognized by the State constitution adopted in 1890 as an essential part of the public-school system. The first president was John W. Hoyt, M. D., LL. D., former Governor of Wyoming. He was succeeded by Albinus A. Johnson, D. D., in 1891, and in 1896 Frank P. Graves, Ph. D., LL. D., was elected to the presidency. Upon his resignation in 1898, Elmer E. Smiley, D. D., became president. The university includes the preparatory school with a three years' course, the college of liberal arts with classical, literary, and scientific courses of four years, and five technical schools—the normal school, the college of agriculture, the college of mechanical engineering, the school of mines, and the business college. The technical schools have courses of five years, beginning with the first preparatory, except the business college, which has a two years' course not leading to a degree. The university is supported by a one-fourth mill State tax, and receives the U. S. grants for the agricultural and mechanical colleges and agricultural experiment station. The main building was erected in 1890 at a cost of $85,000; the mechanical building was completed in 1892, and a science hall has recently been completed. The university publications are two series of free bulletins—one on the agriculture and the other on the economic geology of the State. The laboratories and shops are well equipped. The herbarium contains more than 12,000 specimens, including a collection of about 2,000 species, representing the complete flora of Wyoming as far as explored. The paleontological museum is remarkable for the number and size of its Jurassic saurians. The university is co-educational and non-sectarian, and students are admitted from accredited high schools by certificate. EDWIN E. SLOSSON.

Xenon: a gaseous element obtained from the atmosphere by Prof. William Ramsay, of London, England. It is prepared from liquefied argon, and can readily be separated by the methods used in the isolation of krypton, neon, and metargon, as it has a higher boiling-point and remains behind after the others have evaporated. Its spectrum is analogous to that of argon, but the lines occupy a different position in the spectrum, and the colors vary according to the methods used to produce the discharge. MARCUS BENJAMIN.

X-rays, or **Röntgen** (or **Roentgen**) **Rays**: a special variety of radiation produced when a vacuum tube under pressure is subjected to the electrostatic discharge.

Historical.—When the discharge from an electrical machine or an induction coil passes through the air at ordinary pressures, we have an electric spark which follows a well-defined and narrow path, namely, the path of least resistance between the terminals of the machine. If a portion of the path of the discharge be through rarefied air, as, for example, between metal points inclosed in a glass tube from which the air has been partially exhausted, the spark undergoes changes of character; and when the pressure has been reduced to about 1 cm. of mercury, the beautiful form of discharge known as the Geissler effect (see GEISSLER'S TUBES) begins to show itself. By means of mercurial air-pumps, CROOKES (*q. v.*) carried the exhaustion of the interior of the vacuum tube very much further; and he found that after passing through various striking modifications of appearance, the Geissler discharge ceased and was supplanted by other and new phenomena.

He noted, in the first place, that the discharge no longer passed in the form of a brush or radiant stream from electrode to electrode, but that a scarcely visible bundle of rays appeared to emanate from the kathode. To these the name *kathode rays* has since been applied. Those portions of the glass upon which this bundle of rays fall become finely fluorescent with a characteristic green light.

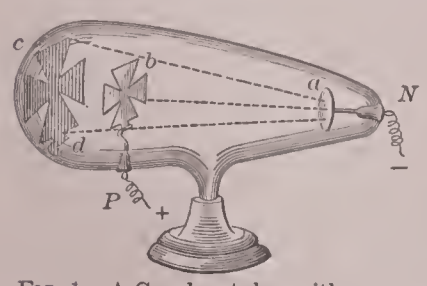

FIG. 1.—A Crookes tube, with cross.

Crookes conceived these rays to consist of particles of electrified matter. He showed among other things that they were capable of being deflected by means of a magnet placed outside the tube; likewise that a metal screen mounted in their path cast a shadow upon the wall of the tube behind it. The form of apparatus by means of which this important property of the kathode rays is usually exhibited consists of a tube (Fig. 1) in the form of a much elongated ovoid, within which is mounted a hinged screen of metal in the shape of a Maltese cross. This can be thrown down or set up in its place by simply tipping the tube. When the cross is erect and the electrode at the end of the tube is the kathode, a sharply defined shadow of the former is seen upon the rounded larger end of the tube.

In 1891 the German physicist HEINRICH HERTZ (*q. v.*) showed that, among other properties, the kathode rays have the power of penetrating many objects opaque to ordinary light, especially the metal aluminium. Following out Hertz's suggestion, his assistant, Dr. Lenard, of Bonn, constructed a vacuum tube with a window of aluminium, against which the kathode threw its bundle of rays. Owing to the transmitting power of that metal, already pointed out by Hertz, these rays were thus caused to leave the tube, and to enter the outer air. Lenard showed the kathode rays to be capable of affecting the photographic plate, and investigated their power of penetrating various substances.

The celebrated paper of RÖNTGEN (*q. v.*) in which he announced the discovery of the X-rays was read before the Physico-Medical Society of Würtzburg, in Dec., 1895. In this brief paper he states the following points concerning the new phenomena, with admirable clearness and precision:

1. That the X-rays appear to emanate only from those portions of the glass of a vacuum tube which are rendered fluorescent by the action of the kathode rays.
2. That their presence may be detected by their effect upon various fluorescent substances (see below).
3. That objects placed between a fluorescent screen and the source of the rays may be made to cast a shadow upon the screen. That he (Röntgen) himself, viewing the shadow of his hand in this manner, saw the shadow of his bones strongly cast and surrounded by the weaker shadow of the flesh.
4. That the X-rays penetrate all kinds of matter, but in very different degrees, and apparently in inverse order to the density.
5. That the X-rays affect the ordinary dry plates used in photography.
6. That the retina of the eye is not sensitive to their action.
7. That the X-rays are incapable of refraction, dispersion, or regular reflection.
8. That, unlike the kathode rays, they can not be deflected by a magnet.

Finally, he puts forth the hypothesis that the X-rays consist in a longitudinal vibration of the luminiferous ether.

These announcements by Röntgen attracted immediate attention, and his experiments were repeated with all imaginable variations throughout the world. His results, particularly as regards the penetrating power of the X-rays through the tissues of the human body, were fully confirmed.

Methods of producing X-rays.—The essential parts of an apparatus for the production of the X-rays are a vacuum tube, the contents of which have been pumped out to the proper degree of exhaustion by a mercurial air-pump, and some suitable device for sending the electrical discharge between the terminals of the tube. A suitable discharge for this purpose may be obtained (1) from an ordinary Ruhmkorff coil; (2) from a Tesla coil; (3) from an influence machine of either the Holtz or the Wimhurst pattern. When the first method is employed, the Ruhmkorff coil (see INDUCTION COIL) is arranged as shown in Fig. 2. The tube is usually introduced directly between the terminals of the secondary coil. The best results are obtained with coils capable of giving a spark from 10 to 25 cm. long in air; the usual length of spark employed is about 15 cm. Much depends upon the character of the interrupter used with the coil. Abruptness of breaking circuit seems to be the essential feature in the performance of the interrupter. Mechanical devices for making and

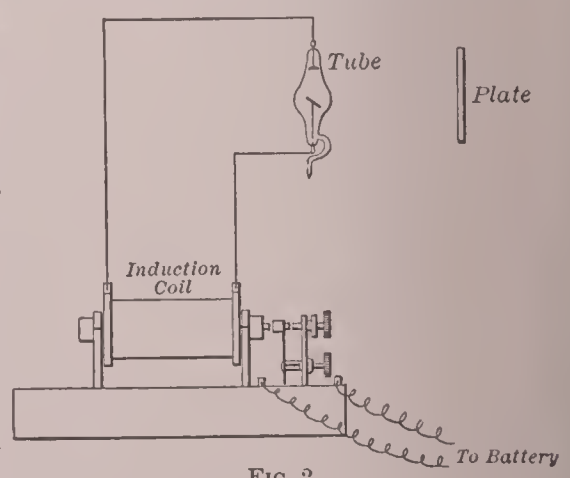

FIG. 2.

breaking have been found to give better results in this respect than the "Neff's hammer" ordinarily used with induction coils.

Any vacuum tube with metal electrodes will produce X-rays when the proper pressure has been reached. Since, however, the principal use of the X-rays consists in obtaining shadow photographs by means of them and permitting the observer to inspect the shadows cast by them upon the screen of the fluoroscope, it is very desirable to have the rays issue as nearly as possible from a single point upon the surface of the vacuum tube. Various forms have been given to X-ray tubes in the attempt to secure these conditions. The X-rays appear to emanate from the surface of any body which is exposed to the rays which issue from the kathode of the vacuum tube. If the kathode be cup-shaped, as shown in the typical forms of tube depicted in Fig. 3, the rays will take the form of a cone; and if the apex of this cone is at the glass wall of the tube the X-rays will emanate only from that point upon the glass where the kathode rays strike. This would be the ideal form for an X-ray tube, but for the fact that the heat generated by the bombardment of the kathode rays is so great as to fuse the glass. The atmospheric pressure then blows in the wall of the tube and ruins it. To avoid this difficulty it is customary to gather the rays from the concave kathode upon an oblique plate of platinum, which acts as a mirror to reflect them outward through the wall of the tube. (See *a* and *c*, Fig. 3.) This platinum plate becomes red hot under the action of the kathode rays. It serves as a radiating center for the X-rays which are produced by the bombardment of the metal.

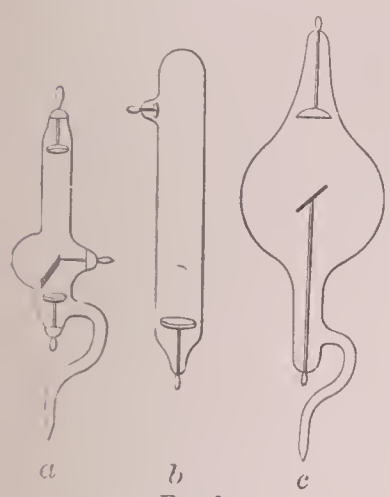

Fig. 3.

A vacuum tube provided with a concave kathode as just described is called a focus tube.

Effects produced by the X-rays.—Since the X-rays have no effect upon the human retina, we become cognizant of them only by indirect methods. Certain substances, such as the double cyanides of platinum and barium, of platinum and magnesium, and of platinum and potassium, the tungstate of calcium, the oxide of zinc, etc., fluoresce when the X-rays fall upon them. If a surface be strewn with one of these materials and be placed in the path of the rays it glows with a pale light as though the substance were faintly incandescent. Calcium tungstate and the cyanide of platinum and potassium appear to be the most sensitive.

If any object be interposed in the path between the vacuum tube whence the X-rays emanate and the fluorescent screen it will cast a shadow. This shadow differs materially, however, from that cast by ordinary light, because many substances which are opaque to the rays which promote vision are transparent to the X-rays, and *vice versa*. Wood, paper, and nearly all vegetable and animal fabrics, such as wool, leather, cotton, and silk, are transparent to the X-rays. Metals, glass, and many mineral substances are opaque. The tissues of the body all transmit these rays to some extent; the bones, however, are comparatively opaque.

The fluoroscope is an instrument based upon this property. It consists of a screen or a sheet of cardboard coated on one side with minute crystals of one of these substances, usually with tungstate of calcium. This is mounted at one end of a hood of opaque material, with an opening for the eyes of the observer at a distance of about 25 cm. from the screen. The usual form is shown in Fig. 4.

If we hold the fluoroscope to the eyes with the screen at a distance of from 20 to 40 cm. from a vacuum tube in which X-rays are being generated, the surface of the screen is uniformly illuminated. If any object be held between the screen and the tube we see the shadow of those portions of it which are opaque to the X-rays. If, for example, a pocket pincushion be held in the path of the rays the substance of the cushion itself will scarcely cast a shadow, whereas each pin will stand out strongly marked. A purse shows only the metal mountings and the coins within. If the hand be held between the fluoroscope and the X-ray tube the skeleton is sharply marked, whereas those portions which are not of bony structure scarcely cast any shadow.

Although the X-rays do not affect the retina, they are capable of acting upon the photographic plate. It is possible, therefore, to take shadow photographs of objects placed

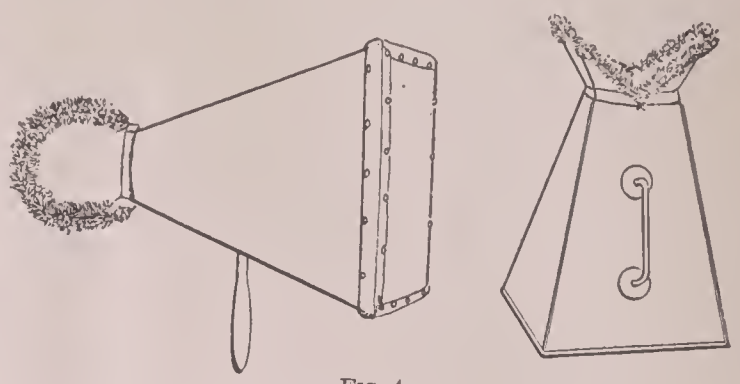
Fig. 4.

between the plate and the tube. The process differs somewhat from that of ordinary photography, since the X-rays can not be brought to a focus by means of lenses.

The operation consists in wrapping the plate upon which the shadow photograph is to be made in black paper in order to protect it from light. It is then set up at a considerable distance from the tube and in such a position that the bundle of X-rays emanating from the tube will fall fully upon it. The object, the shadow of which is to be obtained, is interposed. If great sharpness of detail is required it is customary to place a diaphragm of heavy metal containing a hole about 1 cm. in diameter in front of the tube. In this way the X-rays producing the shadow come from a comparatively small region. Even without this precaution fairly sharp shadows may be obtained.* The varying transparency of different materials to the X-rays is well illustrated by means of Fig. 5, which is from a photograph

Fig. 5.

taken by Prof. G. S. Moler. Several objects—namely, a bunch of keys, a lead pencil, with a metal cap, a chain, a small wheel with saw teeth, and a single metal link—were placed inside a pasteboard box. The chain was placed in a smaller cylindrical box (a pill-box) and the wheel and metal link in a similar one. An ordinary dry plate was wrapped in black paper and fastened to the cover of the box, and a pine board 1 inch thick was introduced between the box and the tube generating the X-rays. Upon developing the plate after exposure to the action of the rays the photograph shown in the figure was obtained. It will be seen that while the pine board was so nearly transparent that no trace of its structure can be seen in the photograph, the pasteboard of which the pill-boxes were made was not entirely transparent. When seen edgewise this material cast a shadow appearing in the picture in form of dark circles surrounding the chain and the link and wheel. The core of the pencil was also partially opaque, whereas the wooden part is scarcely discernible.

Applications of the X-rays.—The chief interest in the phenomena discovered by Röntgen has centered around their

* Various names, such as sciagraph, skotograph, radiograph, shadowgraph, kathodograph, etc., have been proposed for the photographs obtained by means of the X-rays.

application to the human body. The fact that these rays by virtue of their penetrating power enable one to gain a view of the internal organs of the body led to the hope that very important advantages might be gained for surgeons and medical practitioners. These applications are unquestionably being realized to a certain extent. The ability to learn by direct observation of the condition of bones after a fracture, to locate foreign substances, such as bullets, bits of glass, needles, etc., is of great value.

For the examination of the human subject the use of the fluoroscope is frequently to be preferred to the more tedious photographic method. By means of that instrument it is possible not only to inspect the condition of nearly all the bones of the human frame and to detect the presence of foreign substances, but even to observe the pulsations of the heart. It has been found, moreover, that prolonged exposure to the X-rays for the purpose of obtaining photographs has an injurious effect upon the skin. The results are similar to those of a severe burn, and in some cases the roots of the hair are destroyed, producing baldness.

Numerous industrial applications of the X-rays have been suggested, and some of these have already been put to use. The presence of mineral adulteration, such as plaster, soapstone, sand, etc., in articles of food, for example, can be immediately detected by means of the fluoroscope, and with the same instrument it is easy to detect imitation diamonds. The diamond is nearly transparent to the X-rays, whereas an imitation of the diamond in glass casts a strong shadow. To illustrate this point the writer made the photograph reproduced in Fig. 6. A ring of glass cut from a tube was laid upon the paper cover surrounding an ordinary dry plate. A diamond about as thick as the glass was laid within the ring. In the photograph obtained by a five-minute exposure the shadow of the glass ring is dense, whereas that of the diamond is scarcely perceptible.

Fig. 6.

Nature of the X-rays.—Röntgen was inclined to regard the X-rays as longitudinal vibrations of the luminiferous ether. Others are inclined to assume that they consist of a stream of material particles driven at high velocity from the excited surface. It seems probable, however, that they are identical in character with the radiation which produces light, and that they differ from the latter in wave-length only. E. L. Nichols.

Young, Sir George, M. A.: English lawyer, essayist, and poet; b. in Cookham, Sept. 15, 1837; received his school education at Eton, and his college education at Trinity College, Cambridge, where he received the degree of master of arts in 1860, and was made fellow in 1862; read law in Lincoln's Inn, and was called to the bar in 1864. In 1870 he was appointed royal commissioner on the subject of coolie immigration in British Guiana, and on the exploration of the Kaieteur Waterfall, Potaro river; was assistant commissioner on the Friendly Societies commission 1871–73; secretary of the Factory and Workshops Acts commission 1875; member of the Irish Land Acts commission in 1881; president of the senate of University College, London, 1881–86. He is active in promoting the creation of facilities for public education, and was largely instrumental in establishing a teaching university in London. Besides his work in his profession and in public office, he has devoted considerable time to literature, his writings including *The Dramas of Socrates rendered in English Verse, Dramatic and Lyric* (1888); (as editor) the *Works* of Winthrop Mackworth Praed, including *Collected Poems* (1864); *Selections* (1865); *Essays* (1887); and *Political Poems* (1888). F. Sturges Allen.

Young, Robert, LL. D.: b. in Edinburgh, Sept. 10, 1822; learned the printing business; was a literary missionary and superintendent of the Mission Press at Surat, India, 1856–61; conducted the Missionary Institute of Edinburgh 1864–74. He was himself master of many languages, and performed one notable service in biblical learning—the *Analytical Concordance to the Bible* (London and New York, 1880; 6th ed. Edinburgh, 1896). Of his other very numerous works displaying his linguistic and biblical knowledge and versatility may be mentioned his complete translation of the Bible, *Contributions to a New Revision, or a Critical Companion to the New Testament* (Edinburgh, 1881); *Twofold Concordance to the Greek New Testament* (1884). D. in Edinburgh, Oct. 14, 1888. S. M. J.

Young People's Christian Union: a union of all the young people's societies within the Church of the United Brethren in Christ, for purposes of denominational advancement; it was organized June 5, 1890. The union in 1900 comprised 2,008 societies. The total membership approximates 76,000. It has built a mission church in Los Angeles, Cal., and publishes a paper, *The Watchword*.

Zagoskin, Mikhail: dramatist and novelist; b. in Penza, Russia, in 1789; fought in the campaigns of 1812; received afterward an appointment in the imperial library in St. Petersburg; became director of the theater of Moscow in 1820, and keeper of the armory in the Kremlin in 1842. D. in Moscow in 1852. He wrote comedies which were brought on the stage with considerable success, and novels, of which one, *The Young Muscovite* (3 vols., Moscow, 1829), was translated into English (London, 1834).

Zech, Frederick: pianist and composer; b. in Philadelphia, Pa., May 10, 1858, and was taken to San Francisco in 1860, where he began to study music at an early age. From 1877 to 1882 he was studying in Berlin, and part of that time he taught in the New Academy there. In 1882 he returned to San Francisco, and has since devoted himself to conducting, composing, and teaching, besides giving many piano recitals. His compositions are numerous and important. They include five symphonies; four concertos for piano and orchestra; a concerto for violin and orchestra; two symphonic poems, *The Eve of St. Agnes* and *The Raven*; an opera, *The Cruise of the Excelsior*; introduction and fugue for orchestra; concert overture for orchestra; a string quartet; a sonata for piano and violoncello; two sonatas for piano and violin; two sonatas for piano and clarinet; a trio for piano, violin, and violoncello; many piano pieces, and songs for one or more voices.

D. E. Hervey.

Zeeman Effect: an interesting phenomenon in electro-optics discovered in 1897 by Dr. P. Zeeman. In that year Zeeman announced that he had succeeded in demonstrating that the magnetic field exerts a remarkable effect upon monochromatic light. The magnetic field was furnished by an electro-magnet of the Ruhmkorff pattern and of medium size. In most of his experiments this coil was fed by accumulators (Fig. 1, R) which furnished a current of 27 ampères. To permit of observations along the lines of force, the poles of the electro-magnet were perforated (Fig. 1, *h*). Between

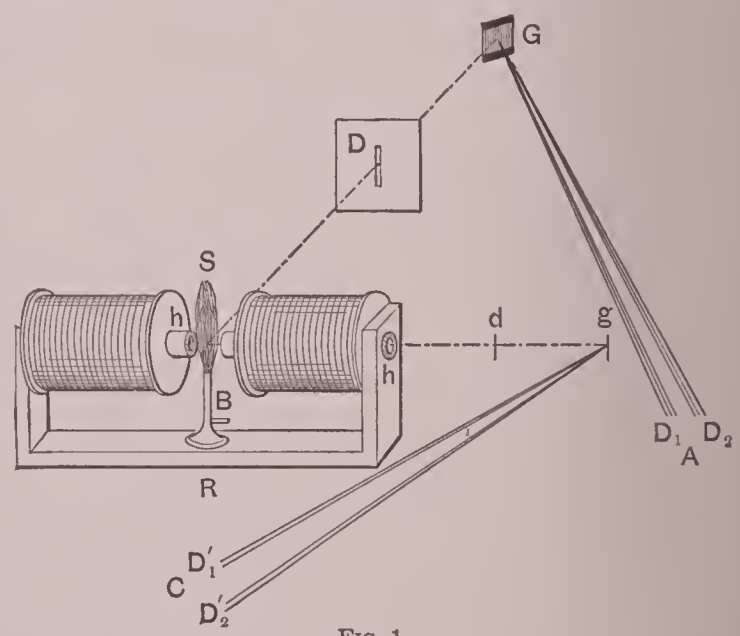

Fig. 1.

the poles was placed the source of light, S, furnished by the flame of a Bunsen burner, B, into which had been thrust a piece of asbestos impregnated with common salt.

The light from this flame, which passed through a narrow adjustable slit, D, was dispersed by means of a Rowland diffraction grating, G. This grating was ruled upon a concave spherical surface with a radius of 10 feet and contained 14,938 lines to the inch. The dispersing power of such a grating is very high, so that with the help of a micrometer eyepiece it is possible to observe with great distinctness the two D lines (D_1 and D_2) of the sodium spectrum.

The poles of the magnet were pushed very close together (7 mm.) in order to get a strong magnetic field. When the

magnetizing current was sent through the coil of the magnet the two D lines were seen to widen very decidedly. When the current was cut off the lines went back to their normal appearance. This experiment was repeated a great number of times with the same result. With the red lines of lithium, obtained by burning the carbonate of that metal in the flame, wholly analogous phenomena were observed. The most natural explanation that suggests itself at first sight would be to ascribe the widening lines of the spectrum of the incandescent vapor to the increase in density of the radiating substance or to a rise of temperature in the flame. Now, it is a fact that in exciting a magnet one can undoubtedly modify the character of the flame. This may be due to a change in its temperature, or possibly to a change in the density of the vapor, and these facts may have something to do with the phenomena described above. By varying the arrangement of his apparatus, however, Zeeman showed that these explanations were insufficient, and proved that the phenomenon could be explained, both quantitatively and qualitatively, in the accepted terms of the electro-magnetic theory of light.

In this theory as stated by Lorentz, the following out of whose mathematical reasoning led Zeeman to discover other important features of his phenomena, it is assumed that all bodies contain small electrically charged particles of definite mass called *ions*. Upon the configuration and motion of these ions all electrical phenomena are supposed to depend. Light-vibrations are vibrations of the ions, which revolve in all kinds of orbits (circles and ellipses) around the center of mass of the molecule. In the sodium flame we may suppose that there are two groups of these motions, each one of a certain period or (what comes to the same thing) of a certain time of describing the circumference of the orbit. It is to these two groups of motions that the emission of light of two different wave-lengths (giving the two D lines of the sodium spectrum) is due.

This view, taken together with the hypothesis of Kelvin and Maxwell, that in a magnetic field a rotatory motion of the ether takes place, the axis of rotation being in the axis of the magnetic forces, leads to a satisfactory and very plausible explanation of the manner in which the ions in the Zeeman phenomenon may undergo a variation of period due to the mechanical forces acting between the ions and the rotating ether. For simplicity we may picture this as follows:

In the sodium flame the ions which cause the light of one of the D lines, for instance D_1, move in all possible directions with circular and elliptical motion; but it is always possible to look at these motions as the result of three simultaneous motions. One of these is a rectilinear harmonic motion in the direction of the lines of force (Fig. 2, R).

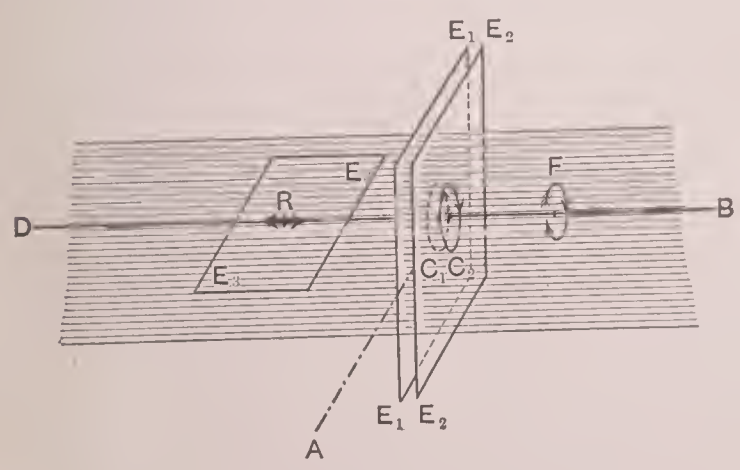

Fig. 2.

This motion, occurring as it does in the axis of the rotatory motion of the ether taking place in the magnetic field, is not affected at all. The other motions are two equal but opposite circular (right-handed and left-handed) motions occurring in a plane at right angles to the lines of force (C_1 and C_2 in the planes E_1 and E_2). These motions take place around an axis, B D, common also to the rotatory motion of the ether, F, in the magnetic field. Now, we may imagine that the circular motion C_2, which occurs in the same direction as the rotatory motion of the ether F, is hastened, while the circular motion C_1 in the opposite direction is retarded by the same amount. This change in each case is proportional to the power of the magnetic field; for, according to Maxwell's theory, the rotatory velocity of the ether in the magnetic field grows in proportion to the strength of the field, and the influence upon the ions will increase in the same way. It is to these motions that light is due, and changes in their period will affect the wave-length of the ray. If we observe the flame at right angles to the lines of force (in Fig. 2 from A, in Fig. 1 from A) we see the light-producing motions of the ions in the following way: the rectilinear harmonic motion R in Fig. 2 is viewed in its true shape and sends toward the observer at A light of unchanged wave-length D_1. It vibrates along the lines of force in the horizontal plane (Fig. 2, E_3). The two circular motions, however, C_1 and C_2, we see in profile, and hence they appear to the observer at A as rectilinear harmonic motions occurring at right angles to the lines of force. These motions send in the direction of an observer at A light-waves in a vertical plane (Fig. 2, E_1 and E_2). The light caused by the motion C_1 has a period somewhat larger, the light from C_2 by the same amount smaller than the light of the line D_1. The same is true of the light belonging to the line D_2.

Owing to the effect of the grating which sorts out the vibrations due to the motion of the ions according to their periods, we see in the eyepiece, in place of each of the two lines D_1 and D_2, three lines, of which the middle one is polarized in a horizontal plane, E_3, parallel to the lines of force. This line has the unchanged wave-length D_1 or D_2, respectively; while lines equally distant to the right and left of these, which are polarized in a vertical plane at right angles to the lines of force, have a wave-length slightly shorter or longer, respectively, than D_1 or D_2. (See Fig. 3, I.) Now, suppose the flame to be observed along the lines of force—as from B or D in Fig. 2, or from C in Fig. 1—for which purpose the slit is placed at *d* and the grating at *g* (Fig. 1).

Fig. 3.

The rectilinear harmonic motion parallel to the lines of force is now end on to the observer, and can not therefore send out transverse radiation in his direction. The consequence is that the middle lines disappear; the two circular motions, however, appear in their true shape, and send in the direction of the observer right-handed and left-handed circularly polarized light (Fig. 3, III). The separation of the lines in this manner and their state of polarization, as just described, are both predicted by the theory, and they were afterward experimentally observed by Zeeman. What is true of an emission spectrum must also hold, with little variation, for absorption spectra, for incandescent vapors emit light of the same wave-lengths as they absorb. If the light of an arc lamp is observed through the sodium flame mentioned above, we see when the magnetic field is not present simply two dark lines corresponding in position to the D lines, with the bright background of the continuous spectrum of the carbons. Under the influence of the field, these undergo changes similar to those already described.

In his first experiments Zeeman observed only a broadening, and no separation of the lines, because the magnetic field and the dispersing power of the grating which he used were not sufficiently powerful. Lines in the spectrum appear to be of finite width, and the magnetic change in the period must exceed somewhat that corresponding to half the width of the original line in order that it may be seen as a doublet. To observe the triple effect shown in Fig. 3, I, the magnetic change of the period must correspond to at least the whole width of the original line. To make this effect observable, it is necessary, therefore, to use a magnetic force at least twice as great as that required for the production of the double line shown in Fig. 3, III. With magnetic forces less than the above, forms intermediate between the unchanged spectral lines and the doublets and triplets may be expected. Fig. 4 illustrates a case where the magnetic change corresponds to somewhat more than half the width of the unchanged line. In this case the line is only broadened. The central part consists of horizontal vibrations; on both sides are bands sending out chiefly unpolarized light, and

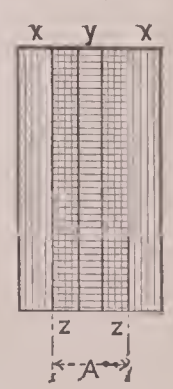

Fig. 4.—Top, polarized light; *x*, *x*, vibrations vertical; *y*, vibrations horizontal; *z*, *z*, unpolarized light; A, original width.

these, again, are inclosed by bands of light the vibrations of which are vertical. Even this form of a triplet enables us to measure the magnitude of the magnetic change; for if we place a Nicol prism before the slit D (Fig. 1), we may quench the horizontal vibrations, whereupon the broadened line is resolved into two separate lines consisting of the outer bands which are vibrating in a vertical plane. The distance between these two lines corresponds to the double change of the period. If a double-image prism be placed before the slit D, the two-plane polarized parts of the broadened line can be separated. The two polarized rays thus formed give rise to two spectra in the field of view, an arrangement that has the advantage of showing the two portions that go to make up the broadened line simultaneously. (See Fig. 5.) With a grating having a radius of 6 feet and 14,438 lines to the inch, Zeeman finally succeeded in observing the triple separation of certain of the lines of cadmium.

Fig. 5.

From his experiments Zeeman concludes that the effective mass of the revolving ion, supposed to have the full unitary charge of electricity, is about 10^{-3} of the mass of the atom. This size corresponds closely with that established by J. J. Thomson for the mass of the electric carriers which are supposed to constitute the kathode rays. It is most interesting, and may prove of great importance to our knowledge of the constitution of matter, to note that consistent estimates of the size of the ion have been derived from such widely different experiments. "The measurement of the distance between the outer components of the triplet," Zeeman remarks, "will also put to test the possible hypothesis that it is only one kind of ions having charges proportional to their effective masses that are free to vibrate in an atom or molecule. On this hypothesis, in a given field, the intervals between the outside components of the triplets (measured in difference of frequency) should be the same for all lines of the spectra of all substances. The measurements show that for different substances the magnetic change is at least of the same order of magnitude. The variation of the phenomenon with wave-length, however, seems more complicated than follows from the hypothesis mentioned, and, in fact, from Lorentz's theory, there is no *a priori* reason to be given for its probability."

The following example, which is taken from measurements of the photographs of spectra, will give some conception of the character of the observations on which the above statements are based. The table contains wave-lengths (λ) of spectrum lines in the blue, violet, and ultra-violet. H is the intensity of the magnetic field, which was measured by means of a bismuth spiral; D is the distance between the components of the separated lines in hundredths of a millimeter. In the fourth column the value in each case of one millimeter in Ångström units is given. The Rowland grating used had a radius of 6 feet and 14,438 lines to the inch. The fifth column indicates the order of the spectrum in which the measurements were made.

It will be seen that some lines are not changed under the influence of the field to a measurable extent.

SUBSTANCE.	Wave-length (λ).	D.	Value of 1 mm. in Ångström units.	Order of spectrum (O).	H.
Zinc.....	4811	18·6	4·41	2d	32×10^{-3}
	4722	20·7			
	4680	25·1			
	3345	Imperceptible.	2·94	3d	32×10^{-3}
	3302	Imperceptible.			
	3282	0			
Cadmium..	4800	22·0	4·41	2d	32×10^{-3}
	4678	24·2			
Tin.....	4585	35·0	4·41	2d	32×10^{-3}
	4525	Imperceptible.			
	4447	?			
	4187	?			

Photographs by Preston and others give still more complicated results. Some lines are separated into distinct triplets, and others show on the photographic plate doublets or quartets and sextets. Others, again, show only a very slight broadening. These various effects are indicated in Fig. 6.

Preston states that all these modifications of a normal triplet may be sufficiently accounted for by supposing that reversal or more or less complete absorption takes place in the case of one or more of the constituents of the triplet. Thus if the middle line of the triplet (Fig. 6, 1) becomes reversed we are furnished with the weak middle quartet (2), and if the middle line becomes completely absorbed in the layers of colder vapor we then have the doublet (3). It is likewise known that the lines of the spectrum are more or less complex in their own constitution, as shown by Michelson for the D lines of sodium and in the case of the green and blue lines of cadmium, and such lines are among those which show deviations from the normal triple type.

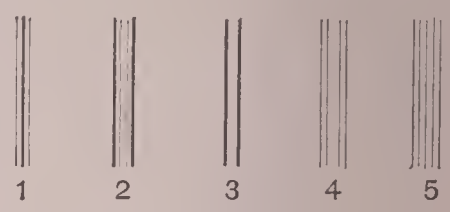

Fig. 6.

Zeeman's important discovery is the normal outcome of the work of those who have gone before. In 1862 Faraday made the relation between light and magnetism the subject of his last experimental work. "He endeavored, but in vain," says Maxwell, in a sketch of Faraday's life, "to detect changes in the lines of the spectrum of a flame when the flame was acted on by a powerful magnet." It was this very quotation that caused Zeeman to try his experiments, which were not successful at first, over and over again. In a paper by Tait, written in 1875, the outline of such experiments is clearly expressed as follows: "The explanation of Faraday's rotation of the plane of polarization of light by a transparent diamagnetic substance requires, as shown by Thomson, molecular rotation of the luminiferous medium. The plane polarized ray is broken up while in the medium into its circular polarized components, one of which rotates with the other so as to have its period accelerated, the other against it in the retarding period. Now, suppose the medium to absorb one definite wave-length only, then the portion absorbed in one ray will be of a shorter, in the other of a longer, period than if there had been no magnetic force, and thus what was originally a single dark absorption line might become a double line, the components being less dark than the single ones." The experiment, however, was never successfully performed until undertaken by Zeeman, unless possibly in the disputed case of Fievez, who states in the *Bulletin* of the Belgium Academy of Science, 3d series, 1885, that with a flame in the magnetic field not only a broadening occurs, but reversal and double reversal of the lines of the spectrum. It is doubted whether the phenomenon described by Fievez is identical with the Zeeman effect.

W. Koenig gives the following simple method of illustrating the influence of the magnetic field which constitutes the Zeeman effect. A sodium flame can be made to absorb the light in a second sodium flame, provided the temperature of the incandescent vapors is suitably regulated. If the second flame is placed between the poles of a powerful electro-magnet, and is observed through the first-mentioned flame, which is placed outside of the field, the light emitted by the flame within the field will be so changed in wave-length that it will no longer be absorbed by the flame outside the field, and the fact that its rays are now capable of passing through this flame is readily observed and may be shown to a large audience. This observation taken by itself would not be conclusive proof of the Zeeman effect, but a study of the polarization of the light affords satisfactory evidence that it is to be explained in accordance with that phenomenon.

LEOPOLD KANN.
Revised by E. L. NICHOLS.

THE END.

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